TELEGRAPH SUPPLEMENT.

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CYRUS W. FIELD, ESQ.—[PHOTOGRAPHED BY BRADY.]

THE ATLANTIC TELEGRAPH:

A HISTORY,

FROM THE FIRST SUCCESSFUL EXPERIMENTS IN TELEGRAPHING TO THE FIRST TRANSATLANTIC MESSAGE.

THE success of the latest and greatest of the marvelous achievements in telegraphing has given a renewed interest to the history of that art, which has done so much to bind the nations of this century to each other with bonds of peace and unity. It is proposed to gratify this interest by presenting, in this Supplement to *Harper's Weekly*, a succinct condensed account of the invention, development, and present condition of electric telegraphing, with illustrations of its various branches.

PRIMITIVE TELEGRAPHS.

Though the art of conveying intelligence by signals was practiced in the earliest ages of the world, and its importance was fully felt by even savage nations in their wars, it received but little improvement in the many centuries which preceded the invention of gunpowder. The primitive modes of telegraphic communication were by means of signal-fires, torches, and trumpets. On the invention of gunpowder, cannon and sky-rockets superseded these; and were, in turn, superseded by the aerial telegraph (or semaphore), which, with carrier pigeons as couriers, has held the field until within a few years, when the electric telegraph has ousted the semaphore with its wooden arms, and done away with pigeons as bearers of dispatches.

CARRIER DOVES.

Before the establishment of semaphore lines in France the Government and the stock-jobbers employed carrier doves, whose rapid flight enabled the first to gain speedy intelligence of political affairs, and the last to make immense fortunes by taking advantage of the market. They were, however, insecure couriers. Hawks were trained by illegitimate operators to pounce in mid-air upon the messenger dove and bring it down, when it was robbed of its dispatch. Men lay in wait upon its track and enticed it into a trap with aniseed and other Columbine delicacies. Sharp-shooters were stationed upon the roads outside of Paris to shoot down the unlucky dispatch-bearers. So far was this rascality carried that a decree of Louis Philippe forbade the use of carrier doves, as being only an incentive to various misdemeanors.

THE FIRST SEMAPHORE.

In the year 1684 Dr. Hooke described a plan for an aerial telegraph; and about 1704 M. Amontos instituted experiments with the same end in view. However, neither of these plans were carried into effect; and it was not until 1794 that the semaphore was actually used. In that year an aerial telegraph, the invention of M. Claude Chappé, was employed for the transmission of intelligence between Paris and Lille; the conveyance of a signal from one of these places to the other occupying only two minutes. Semaphores, mostly modifications of the plan of Chappé, were in use in England in 1795; Denmark, in 1802; India, in 1823; Prussia and Austria, about 1833; and Russia, in 1839.

This method of telegraphing is still in use, but is rapidly being superseded by the electric telegraph. In 1852 the only aerial telegraph line in England was between Liverpool and Holyhead. This has now been superseded by the establishment of electric communication between those two places. There was, until quite recently, a semaphore line from Sandy Hook to New York; but this also has been superseded by an electric line. The New York press, also, for some years employed carrier pigeons to bear packages of late papers from steamers boarded outside Sandy Hook to the city. These, too, are now discontinued.

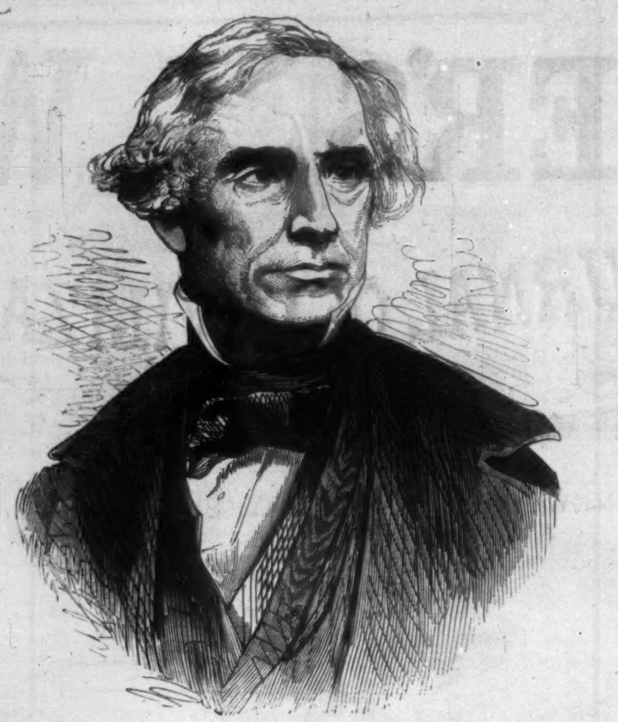
The cost of working the aerial telegraph was enormous. The line between Holyhead and Liverpool, but a few miles long, cost in the vicinity of £1500 (about $7500) per annum; and a similar line, between London and Portsmouth, cost £3300 (about $16,500) per annum; also, these telegraphs were necessarily imperfect, being limited in their power of conveying intelligence, exceedingly slow, and liable to total interruption by storms of rain and snow, fogs and darkness.

ELECTRICITY AS A TELEGRAPHIC AGENT.

The idea of employing electricity as a means of conveying intelligence had long been entertained, and experiments to ascertain the practicability of electrical communication between distant places were early made by scientific men throughout the civilized world. We premise that the discoverer of a new thing is not he who first speaks or thinks of it, but he who first speaks of it so plainly as to win the world to his opinion, inspire it with his own faith, and force it to a recognition of the value of the improvement he aims to introduce; and that, consequently, Professor Morse, although among the last in point of date, is entitled to the foremost rank among the many who have contributed by their researches and experiments toward the successful application of electricity to the purposes of telegraphing.

CHRONOLOGICAL SUMMARY OF THE PROGRESS OF ELECTRIC TELEGRAPHING.

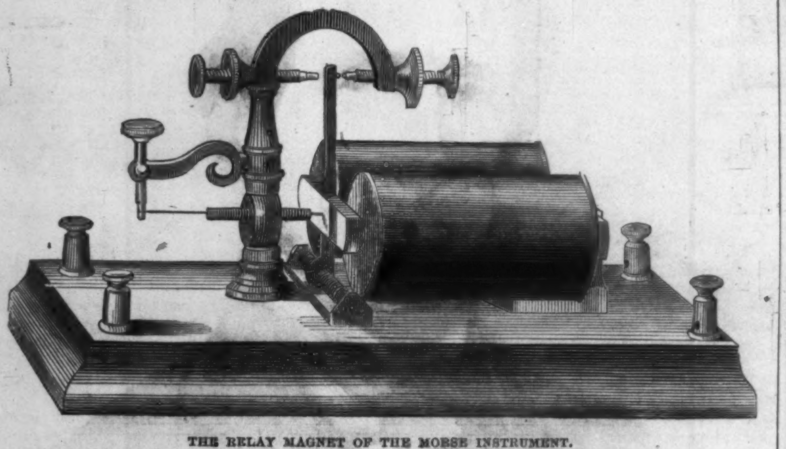
1729.—Grey and Wheeler, Englishmen, discovered that a current of electricity could be made to flow through considerable lengths of wire.



PROFESSOR MORSE, THE INVENTOR OF THE TELEGRAPH.

1746.—Winckler at Leipsic, and Le Monnier at Paris, experimented on the same subject of the transmission of the electric current through conducting bodies.

1747.—Dr. Watson, in England, repeated and extended these experiments, sending a current through two miles of wire and two of earth; sending shocks across the Thames and the New River. Dr. Franklin in 1748, and De Luc in 1749, repeated many of these experiments. In addition, experiments, bearing more or less on the subject of electric telegraphy, were made by Lesage in 1774, Reusser in 1794, Cavallo in 1795, Betancourt in 1798, Sœmmering in 1807, and Professor Oersted in 1819.



THE RELAY MAGNET OF THE MORSE INSTRUMENT.

1798.—The first electric telegraph actually applied seems to have been the invention of M. D. F. Salva. Humboldt says his telegraph was established between Madrid and Aranjuez in 1798—a distance of about 26 miles.

Previous to 1809 no mode of electric telegraphing capable of any extended use had been discovered. The principal cause of failure seems to have been in the employment of frictional electricity, which is, on account of its high intensity, confined with great difficulty to conducting bodies, rapid and incontinuous in its action, and, from its small quantity, devoid of energetic force.

1809.—Sœmmering made a step forward by his application of galvanism to the purposes of telegraphing. He constructed, at Munich, a telegraphic apparatus, using thirty-five wires. The signals were made by the decomposition of water in thirty-five tubes, which were in connection with the thirty-five wires of the line.

1816.—Francis Ronalds, of Hammersmith, England, constructed a telegraph of eight miles in length. This telegraph was one of the best that had then been invented, and was capable of transmitting intelligence with considerable rapidity. In 1823 he urged the importance of his invention for Government purposes, writing to Lord Melville on the subject, but without effect.

1819.—Professor Oersted, of Copenhagen, made a discovery which introduced a new feature into electric telegraphing. He found that if a wire charged with electricity is placed parallel to a magnetic needle, the needle will deviate from its natural position, tending to assume a position at right angles with the conducting wire; and that this deviation follows a regular law. Proceeding on the groundwork of Professor Oersted, Arago and Ampère in France, and Sir H. Davy in England, discovered that a current of electricity would render steel magnetic; and Ampère found that by coiling the wire in the form of a helix round steel the effect was greatly increased; the last a most important discovery, by means of which a battery of small power is enabled to produce effects for which it would otherwise be inadequate.

1820.—Oersted's great discovery gave a new direction to the science of electric telegraphing. Galvanic telegraphs were, in turn, discarded, and magneto-electric telegraphs took their place. Ampère was the first to make use of Oersted's discovery in telegraphing. In 1820 he invented a telegraph, using thirty-six magnetic needles. His plan was not practically carried into effect.

1825.—William Sturgeon, of London, discovered and constructed the electro-magnet. The electro-magnet is one of the most valuable parts of the electric telegraph now in use, and has entered more or less into nearly every telegraph invented since its discovery.

1827.—Harrison G. Dyer, an American, constructed a telegraph on Long Island, using frictional electricity. The line was about two miles in length.

1831.—Professor Henry, of Princeton College, discovered a method of creating, by means of corresponding batteries, magnets of various powers, by the use of which, with *relays*, it became possible to produce magnetic effects at great distances; say 1000—2000 miles.

1832.—Baron de Schilling invented a needle telegraph at St. Petersburg. His instrument had five needles, which, by their vibrations to the right or left, indicated signals. He afterward improved his instrument, using but one needle.

1832.—Also Professor S. F. B. Morse, returning from France in the packet ship *Sully*, conceived the idea of employing the electro-magnet to effect communications at a distance by leaving a permanent record, by signs answering to an alphabet, and to effect this in such manner that not only the extremes of a line of any length should communicate, but that communications might be effected with any place between. After various trials, much difficulty, and discouragement, Professor Morse, at length, in 1835, demonstrated the practicability of his idea by putting in operation a model of his "Recording Electric Telegraph" in the New York University, sending the current through 1700 feet of wire.

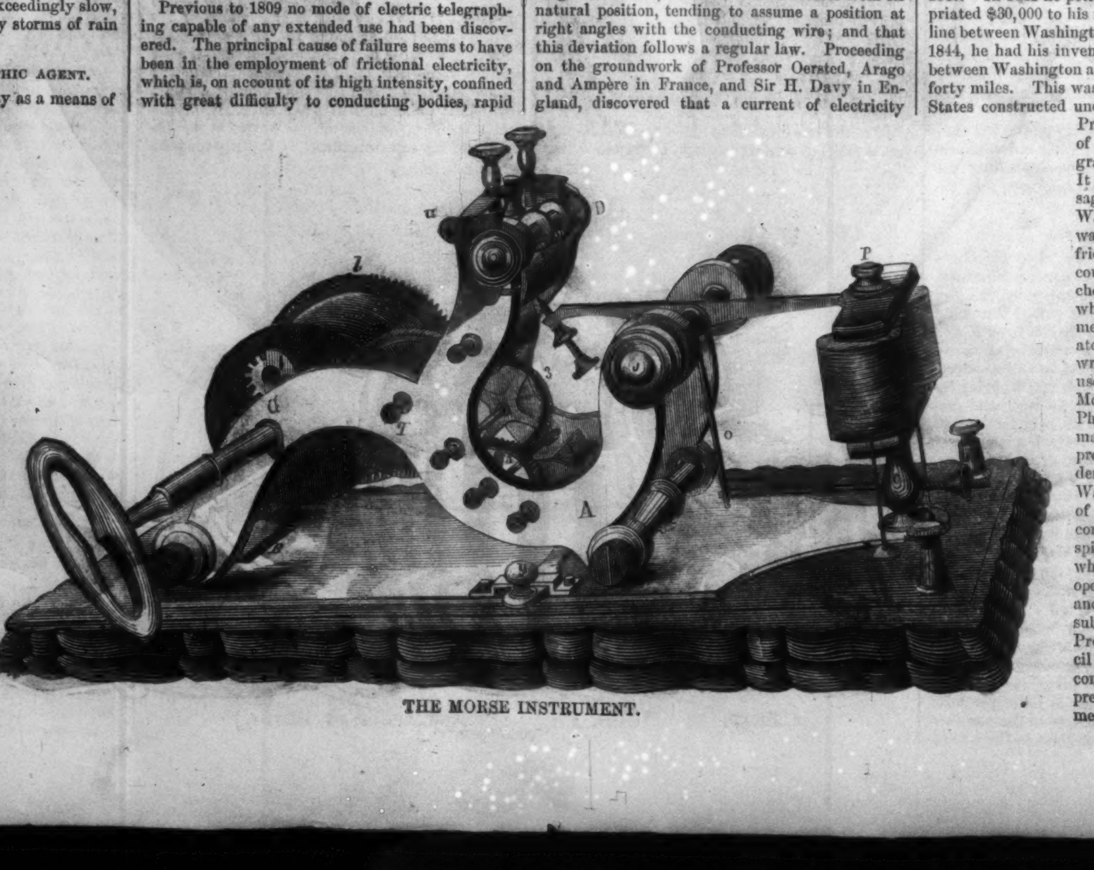
1837.—Professor Morse filed his caveat in the Patent office in Washington. In the same year Dr. Steinheil, of Bavaria, had a telegraphic instrument working a distance of twelve miles. His telegraph of one wire, and either one or two magnetic needles, as might be desired, made permanent marks on paper, and also telegraphed by sound. When writing, his needles were furnished with ink-tubes, and by their motions marks were recorded on paper; when telegraphing by sound, the needles were made to strike bells of different tones. He used the earth as part of the circuit.

Also, and in the same year, Messrs. Cooke & Wheatstone, in England, obtained a patent for "improvements in giving signals and sounding alarms in distant places, by means of electric currents transmitted through metallic circuits." This seems to have been the first telegraph that was patented in Europe. Cooke & Wheatstone's first telegraph was a needle telegraph. They used five magnetic needles and five wires. An electro-magnet was used to sound an alarm. A second patent, taken out by Cooke only, was issued in April, 1838. These instruments were found to be very imperfect, and, after a short trial, were abandoned.

A different form of telegraph, the invention of the same parties, having but two needles, has, until very recently, been in general use in England; but the Morse system is now being adopted there and upon the Continent.

1840.—Bain took out his first patent in the United States. His instrument is galvanic, and not magneto-electric, as are all the others now in use. He received a second patent in England for an improved instrument, in 1846. Of this, as of the various others now in use, we shall give descriptions farther on.

1844.—Professor Morse took out his patent in 1840. In 1842 he petitioned Congress, who appropriated $30,000 to his use for the construction of a line between Washington and Baltimore. In June, 1844, he had his invention in successful operation between Washington and Baltimore—a distance of forty miles. This was the only line in the United States constructed under Government patronage. Professor M. was at the end of his means when Congress granted him his appropriation. It is related that the first message sent over the wires of his Washington and Baltimore line was forwarded by a young lady friend, who had constantly encouraged the Professor, and cheered him with her firm faith, when no one else believed. The message was in these appropriate words: "What hath God wrought?" Its first public use is related by Professor Morse himself. During the Philadelphia riots of 1844 the mayor of that city sent an express by railway to the President of the United States at Washington. On the arrival of the train at Baltimore the contents of the express transpired, and the telegraph, which was then just put in operation between Baltimore and Washington, sent on the substance of the dispatch. The President held a cabinet council while the dispatch itself was coming, and had his answer prepared and delivered to the messenger who brought the



THE MORSE INSTRUMENT.

dispatch at the moment of his arrival, who returned with it instantly to Philadelphia.

1845.—The last patent taken out by Cooke & Wheatstone is dated May 6, 1845. During the same year an act of Parliament was obtained incorporating "The Electric Telegraph Company," working these patents.

The needle telegraph is, comparatively, very slow; the average speed per message being but 14 words per minute. It is, however, yet extensively used in England. Cooke & Wheatstone took out a patent in America, but their instrument was never practically used in the United States.

Since Cooke & Wheatstone's first patent, upward of 40 patents have been taken out in England alone. Very few of the instruments since invented are in practical operation.

1847.—Royal House, of New York, in conjunction with his partner Mr. Brett, took out a patent for that rather intricate but most beautiful instrument known as the House Printing Telegraph.

1849.—Horatio Hubbell and John H. Sherburne memorialized Congress, praying for an appropriation to lay an interoceanic telegraph cable upon the just then discovered plateau between Newfoundland and Ireland. Congress could make no appropriation for the purpose.

1855.—David E. Hughes, of Kentucky, patented his double acting printing telegraph, which, if it does all that is claimed for it, will work a revolution in telegraphing.

This completes the chronology of the electric telegraph. We come now to descriptions of the chief instruments at present in use.

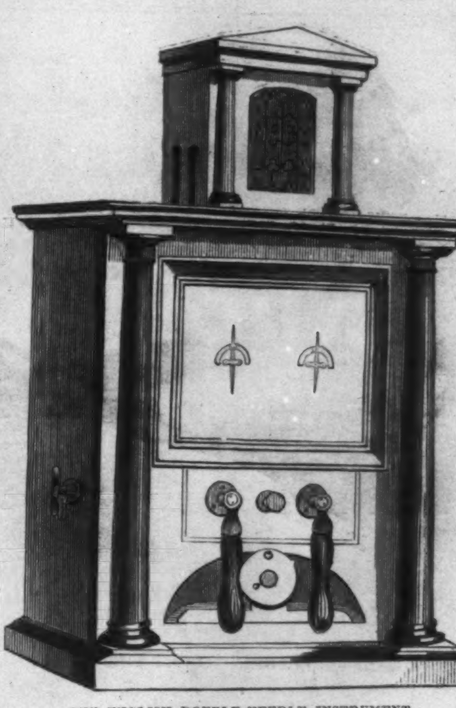
THE PROBLEM.

The problem to be solved by the electric telegraph may be stated as follows:

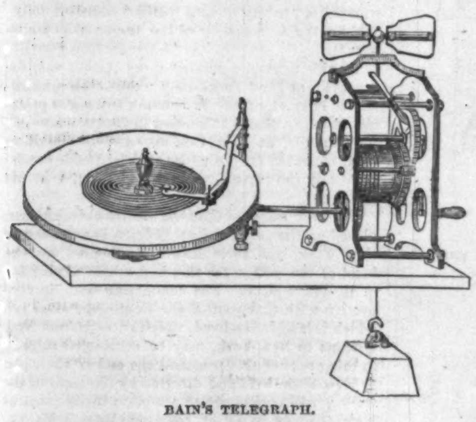
1st. To produce or develop the electric fluid in any desired quantity, and of the necessary quality.

2d. To transmit it with celerity to any required distance, without injuriously dissipating it.

3d. To cause it upon its arrival at any assigned point to produce some sensible effects, which may serve the purpose of written or printed characters.

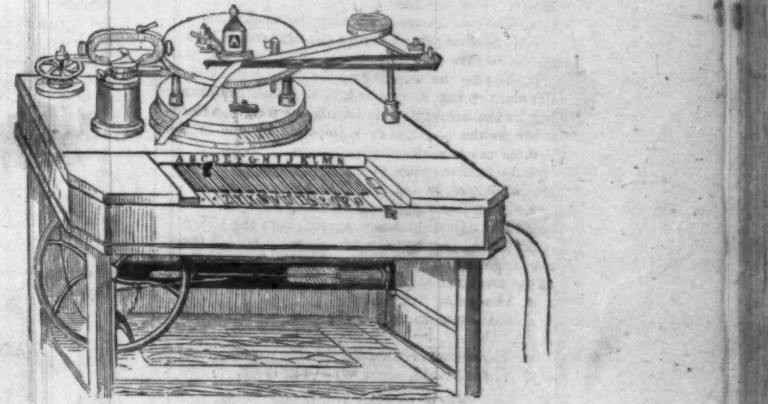


THE ENGLISH DOUBLE-NEEDLE INSTRUMENT.



BAIN'S TELEGRAPH.

SIGNS OF NEEDLE INSTRUMENT.



THE HOUSE INSTRUMENT.

It was for a long time difficult to obtain from the batteries used a sufficiently constant and equable current. Space forbids us to enter at length into the difficulties which had to be overcome. It is sufficient to say that the batteries now mostly used are those made according to the formula of Daniel or Grove.

GROVE'S BATTERY.

Grove's battery consists of two liquids, sulphuric and nitric acids, and two metals, zinc and platinum, arranged in the following manner: A hollow cylinder of zinc, open at both ends, is placed in a vessel of glazed porcelain. Within this is placed a cylindrical vessel of unglazed porcelain, a little less in diameter than the zinc, so that the space of about a quarter of an inch may separate their surfaces. In this vessel is inserted a cylinder of platinum, open at the ends, and a little less than the second vessel, so that their surfaces may be about a quarter of an inch asunder. Dilute sulphuric acid is then poured into the glazed porcelain vessel, and concentrated nitric acid into the unglazed porcelain vessel. The wire proceeding from the platinum will then be the positive, and that proceeding from the zinc the negative pole.

The articles consumed in telegraphing are enumerated as follows: Platinum, nitric and sulphuric acids, zinc, quicksilver (for amalgamating the zinc, etc.), skeleton forms for messages, ink, envelopes, pencils, and pens.

POSTS AND WIRES.

The conducting wires used for telegraphic lines are of iron, usually the sixth of an inch in diameter. On all European lines they are submitted to a process called galvanization, being passed through a bath of liquid zinc, by which they become coated with that metal. This zinc surface being easily oxydable, is soon by the action of air and moisture, converted into the oxyde of zinc, which, being insoluble by water, remains upon the wire, and protects the iron from all corrosion. Copper would be better, being a better conductor, but its greater cost admits of its use only on submarine lines, where it is desirable to have the best conductor, regardless of expense. American wires are not generally galvanized. The plan was tried, between Boston and New York, but was not found to answer, the galvanized wires working with less certainty than bare wires. Telegraph posts are generally erected at intervals of about sixty yards, being at the rate of thirty to a mile. They therefore supply incidentally a convenient means by which a passenger can ascertain the speed of the train in which he travels. If he count the number of telegraph posts which pass his eye in two minutes, that number will express in miles per hour the speed of the train. Insulators on the posts are made of a superior quality of glass in the United States. In Europe earthen-ware is used. At intervals of half a mile are found *winding posts*, so called because, by means of a screw contrivance, the wires are there tightened when slack.

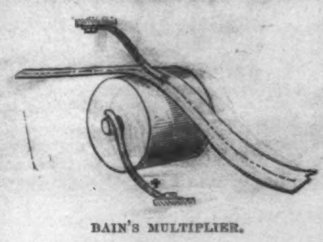
In Europe subterranean cables have been laid to considerable extent; but they are not so successful as desirable, great trouble being occasioned to discover any defects which may occur from time to time along the lines.

VELOCITY OF THE ELECTRIC CURRENT.

Although there is some discordance in the results of experiments made to determine the velocity of the current, they all agree in proving it to be prodigious. It varies according to the conducting power of the metal of which the wire is composed, but is not dependent on the thickness of the wire. On copper wire, its velocity, according to Professor Wheatstone's experiments, is 288,000 miles; and according to those of MM. Fizeau and Gonelle, 112,680 miles per second. On the iron wire used for telegraphic purposes, its velocity is 62,000 miles per second, according to Fizeau and Gonelle; 28,500 according to Professor Mitchell, of Cincinnati; and about 16,000 according to Professor Walker.

BAIN'S INSTRUMENT.

We come now to describe the chief instruments used. And here it will be well to state, for the benefit of the uninitiated, that every instrument has attached to it a *motor*, either clock-work or spring, by which *all* the motions of various parts of the apparatus are produced, *except only one* motion of the recording magnet. Bearing this in mind, we will proceed to a description, first, of Bain's Instrument, which, as the reader will remember, is operated by pure galvanic force. The galvanic current is received upon chemically-prepared paper, where it leaves a light-blue mark. A combination of dots constitute the alphabet.



BAIN'S MULTIPLIER.

To render this instrument understood, let us suppose a sheet of writing-paper to be wetted with a solution of prussiate of potash, to which a little nitric and hydrochloric acid have been added. Let a metallic desk be provided corresponding in magnitude with the sheet of paper, and let this desk be put in communication with a galvanic battery so as to form its negative pole. Let a piece of steel or copper wire forming a pen be put in connection with the same battery so as to form its positive pole. Let the sheet of moistened paper be now laid upon the metallic desk, and let the steel or copper point which forms the positive pole of the battery be brought into contact with it. The galvanic circuit being thus completed the current will be established, the solution with which the paper is wetted will be decomposed at the point of contact, and a blue or brown spot will appear. If the pen be now moved upon the paper, the continuous succession of spots will form a blue or brown line, and the pen being moved in any manner upon the paper, characters may be thus written upon it as it were in blue or brown ink.

An extremely feeble current is sufficient to produce this effect; but it will be necessary, when the strength of the current is very much reduced, to move the pen more slowly, so as to give the time necessary for the weakened current to produce the decomposition.

The metallic desk is a circular disc about twenty inches in diameter. It is fixed on a central axis, with which it is capable of revolving in its own plane. A uniform movement of rotation is imparted to it by means of a small roller, gently pressed against its under surface, and having sufficient adhesion with it to cause the movement of the disc by the revolution of the roller. This roller is itself kept in uniform revolution by means of a train of wheel-work, deriving its motion either from a weight or main-spring, and regulated by a governor or fly. The rate at which the disc revolves may be varied at the discretion of the superintendent, by shifting the position of the roller toward the centre; the nearer to the centre the roller is placed, the more rapid will be the motion of rotation. The moistened paper being placed on this disc, we have a circular sheet kept in uniform revolution.

The electro-chemical pen, already described, is placed on this paper at a certain distance from its centre. This pen is supported by a pen-holder, which is attached to a fine screw extending from the centre to the circumference of the desk in the direction of one of its radii.

On this screw is fixed a small roller, which presses on the surface of the desk, and has sufficient adhesion with it to receive from it a motion of revolution. This roller causes the screw to move with a slow motion in a direction from the centre to the circumference, carrying with it the electro-chemical pen. We have thus two motions, the circular motion carrying the moistened paper which passes under the pen, and the slow rectilinear motion of the pen itself directed from the centre to the circumference. By the combination of these two motions it is evident that the pen will trace upon the paper a spiral curve, commencing at a certain distance from the centre, and gradually extending toward the circumference. The intervals between the successive coils of this spiral line will be determined by the relative velocities of the circular desk and of the electro-chemical pen.

By breaking the circuit, at regular or irregular intervals, it is evident that a succession of dots and lines will be produced, it being understood that the action of the galvanic current is instantaneous, and that the decomposition of the solution on the prepared paper takes place only while the connection is perfect.

BAIN'S MULTIPLIER.

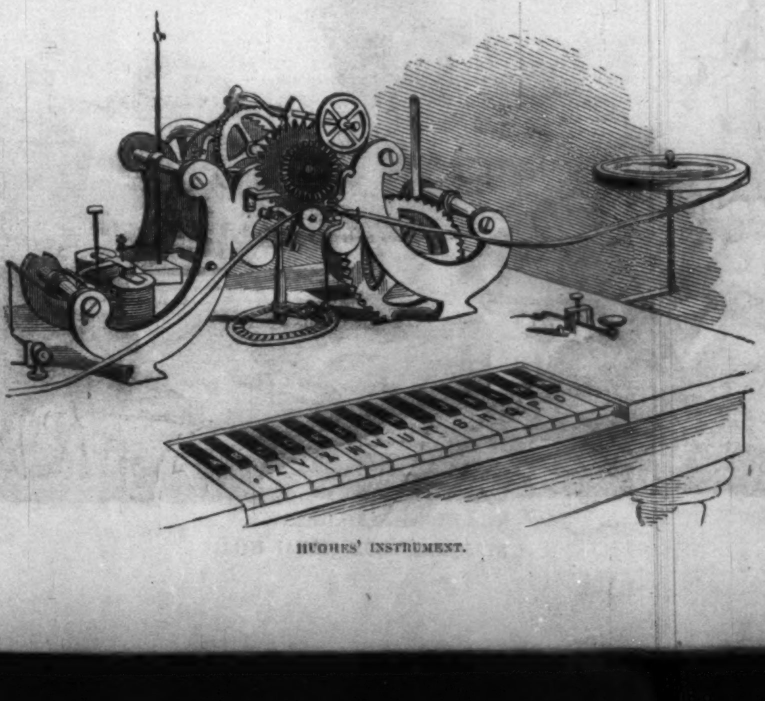
The rate of transmission with Bain's instrument is, under ordinary circumstances, quite moderate. But by means of a most ingenious printing apparatus, also the invention of Mr. Bain, its celerity was increased to an extent which placed it in this point very far ahead of all other instruments at present in use, enabling the operators to transmit messages at the astonishing rate of 1200 words per minute, or nearly 2000 words per hour. To attain this speed, the dispatch to be sent must be previously printed, in the dot and line alphabet, upon long slips of paper, placed for the purpose upon rollers, and submitted to a punching machine of extreme rapidity, worked by a simple mechanism which allows the operator to suspend its motions at will. Practiced operators thus transfer the written dispatch to the perforated paper in less time than it could be set up by a compositor. By employing several punching machines, of course a long dispatch can be reprinted in very short time. We come now to its transmission. The paper ribbon being again wound upon a roller, this is attached to the telegraph instrument. Our illustration will sufficiently explain the following operation.

The extremity of the perforated ribbon at which the message commences is now carried over a metallic roller, which is in connection with the positive pole of the galvanic battery. It is pressed upon this roller by a small metallic spring, terminating in points like the teeth of a comb, the breadth of which is less than that of the perforations in the paper. This metallic spring is connected with the conducting wire which passes from the station of departure to the stations of arrival. When the metallic spring falls into the perforations of the ribbon of paper as the latter passes over the roller, the galvanic circuit is completed by the metallic contact of the spring with the roller; but when those parts of the ribbon which are not perforated pass between the spring and the roller, the galvanic circuit is broken and the current is interrupted. A motion of rotation being communicated to the metallic roller, it will be perceived that the successive intervals of the transmission of the current must correspond precisely with the perforated characters expressive of the message, and the same succession of intervals of transmission and suspension will affect the writing apparatus at the stations of arrival in the manner already described. There is no limit to the speed with which this process can be executed, nor can there be an error, provided only that the characters have been correctly marked on the perforated paper.

THE MORSE INSTRUMENT.

The Morse Electro-magnetic Telegraph consists mainly of two parts—the receiving magnet and the registering apparatus. The receiving magnet is surrounded by fine wire, and is of the horseshoe form. An adjustable armature is placed before the poles of the receiving magnet. The main circuit passes unbroken through the receiving magnet to the next station.

The registering apparatus has a powerful horseshoe magnet placed vertically. Above the poles of the magnet is an armature attached to one end



HUGHES' INSTRUMENT.

of a movable lever, on the other end of which is a steel style for the purpose of impressing marks on paper placed immediately above the style. Intelligence is transmitted by means of breaking and closing the main circuit. For this purpose a small key is employed. When this key is pressed down the current passes to the receiving magnet of the distant station, causing the receiving magnet to close the local circuit. On the local circuit being closed, the registering magnet becomes excited and attracts the armature downward, causing a mark on the paper placed above the lever of the armature. On the circuit being opened again by the operator's raising the key, all returns to its usual quiescent position. This operation is performed at every closing and breaking of the circuit. By keeping the key depressed for an instant, a dot is made; if it is depressed for a longer time, a line. A combination of dots and lines forms the telegraphic alphabet used with this system. The speed of this instrument is, in the hands of an expert, about twenty words per minute.

As Professor Morse's instrument is the one in most general use in this country, and is gradually superseding all others in use in England and on the Continent of Europe, we give two views of it, which, with the above description, will sufficiently explain its operations to the reader. In the perspective view of the instrument, on page 2, the following figures will assist the reader in comprehending the uses of the various parts:

Z. The wooden base upon which the instrument is screwed.

B. The brass base plate attached to the wooden base Z.

A. The side frames supporting the mechanism.

h, h. Screws which secure the transverse bars connecting the side frames.

G. The key for winding up the drum containing the main-spring, or supporting the weight, according as the mechanism is impelled by one or the other power.

3, 4. Clock-work.

u. A lock or gauge to regulate the pressure of the rollers on the paper.

c. The pillar supporting the electro-magnet.

p. The adjusting screw passing into the pillar, *c*, projecting through the armature, to enable the telegraphist to adjust the sound of the back stroke of the armature at pleasure.

o. The spring bar, and

d. the screw to adjust the action of the pen lever.

D. The apparatus for adjusting the paper rollers.

f. The adjusting screw of the pen lever.

TELEGRAPHIC ALPHABET.

The following are the telegraphic characters adopted by Mr. Morse for the English language:

				Numerals.	
A	· —	O	· ·	1	· — — ·
B	— · · ·	P	· · · · ·	2	· · — · ·
C	· · ·	Q	· · — ·	3	· · · — ·
D	— · ·	R	· · ·	4	· · · · —
E	·	S	· · ·	5	— — —
F	· — ·	T	—	6	· · · · · ·
G	— — ·	U	· · —	7	— — · ·
H	· · · ·	V	· · · —	8	— · · · ·
I	· ·	W	· — —	9	— · · —
J	— · — ·	X	· — · ·	0	——
K	— · —	Y	· · — · ·		
L	——	Z	· · · ·		
M	— —	&	· · · ·		
N	— ·				

PROFESSOR MORSE.

Professor Morse is now sixty-seven years of age. He was born at Charlestown, Massachusetts, on 27th April, 1791, and having graduated at Yale, in 1810, went to London, England, to study painting under Allston. He returned to the United States a few years afterward, and made a living by painting.

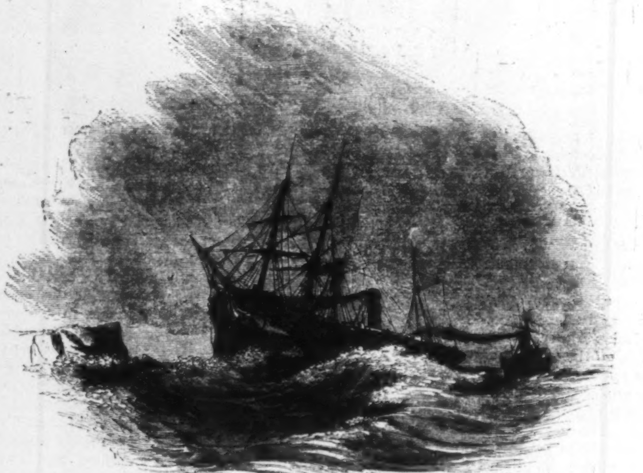
Forty years ago, when he was an art student in London, a pupil of Allston, West, and Copley, he would have gladly discounted his glory in advance for the satisfaction of painting a picture like the Death of Wolfe. Thirty years ago, when he was a poor portrait-painter at Charlestown and Boston, when he traveled through the country villages painting portraits at fifteen dollars apiece, and not unfrequently at a loss for work, a very few dollars secured safely would have satisfied his worldly aspirations.—Twenty years ago, when he dreamed out the electric telegraph on board an ocean steamer, the realization of that magnificent dream seemed so distant that, though his genius saw it, his judgment shed a mist of doubts, and he dared not be positive in his conviction even to his own mind. And now all his brightest hopes are realized; he enjoys fame, a competency, a world-wide recognition.

Not many days since, in conversation with the writer, and in reply to a remark on the subject of the rival claims of Wheatstone and the European "discoverers" or "inventors" of the electric telegraph, Professor Morse cried, hastily, "Ah! Sir, but they are noble fellows; they behaved nobly to me, Sir; they are true men of science." He would not hear a word said in disparagement of the men who had done their utmost to rob him of his fame, and who had succeeded in robbing him of half his fortune.

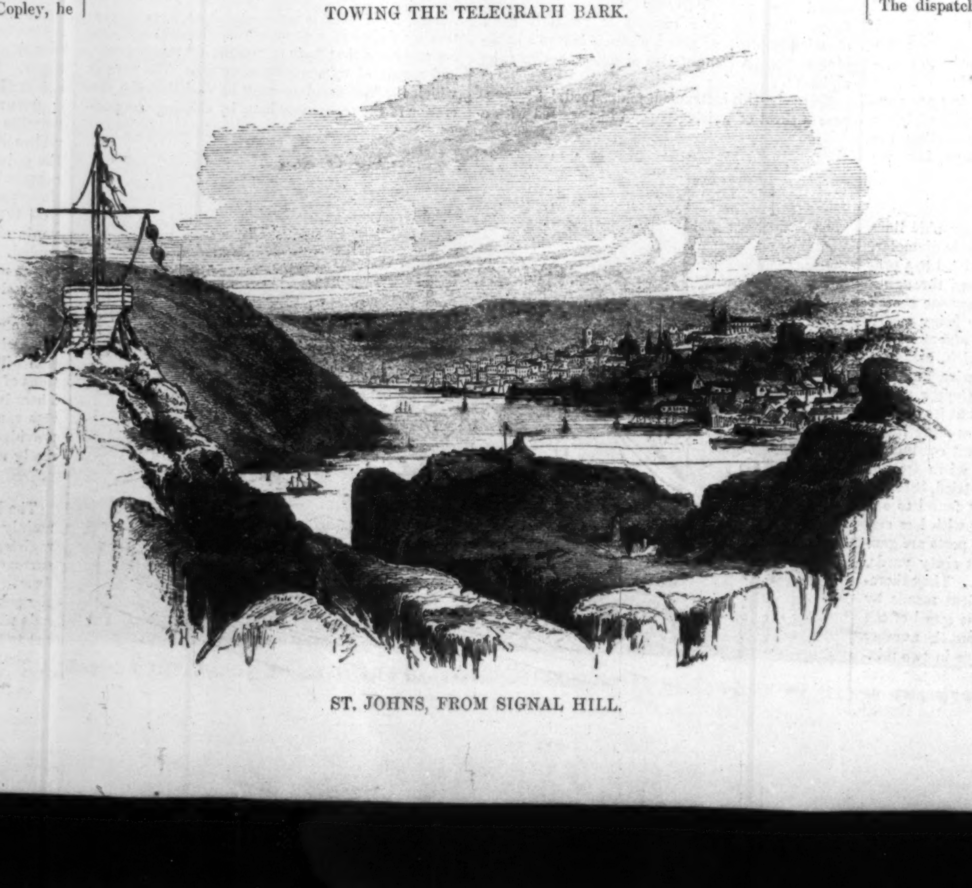
THE GALE—PREPARING TO CUT THE CABLE.

CAPE RAY—TELEGRAPH HOUSE.

The writer ventured to suggest a doubt of the feasibility of the Transatlantic Telegraph; adding that "many persons believe the line can't be laid."



TOWING THE TELEGRAPH BARK.



ST. JOHNS, FROM SIGNAL HILL.

"Can't! Sir, can't!" replied the venerable Professor, quickly; "I have forgotten the meaning of that word. We must succeed. When Lord Clarendon said to Mr. Field, on the occasion of their last interview, 'But suppose you lose the wire, as you lost the one to Newfoundland?' Mr. Field answered, quickly, 'Then, my lord, we shall give orders directly for the manufacture of another!'—and that, Sir," continued the Professor, with energy, "is the spirit with which we go about this matter."

Professor Morse has, unfortunately, not been connected with this last expedition. He is now in Europe receiving from the governments of Europe the subsidy they have at last agreed to pay him for the use of his telegraphs. No one will rejoice more heartily at the success of the enterprise than he.

CURIOSITIES OF TELEGRAPHING.

Bain's telegraph is faster than Morse's, and House's characters are surer and less liable to error. The question is often asked, how it is that Morse's takes the lead of all in practical use? To this it may be answered that the speed of the Morse instrument is sufficient for all present purposes, the telegraph not having as yet come into so very general use as to require extraordinary facilities in the transmission of messages. On the other hand, the Morse instrument is far more simple, and less likely to get out of order, under the hands of an average manipulator, than any of its rivals; and this is a most important consideration. This is, in fact, the chief reason for its general adoption on the continent of Europe.

A modification of the electro-chemical telegraph has been contrived, by which a dispatch may be transmitted to any distant station, and then delivered in the *handwriting* of the person who transmits it.

By this method a person at any station—as, for example, at New York—may write a communication in characters used in common writing or printing on paper placed at another distant station—as, for example, at New Orleans—and this writing shall be traced on the paper with as much precision as if the person writing held the pen in his hand.

We may imagine that the electro-chemical pen placed on the paper at New Orleans is extended to New York, and there held and directed by the hand of the writer, for this it is which almost literally takes place. The conducting wire, in connection with that part of the electro-chemical pen which is held in the hand, which extends from New Orleans to New York, may be considered as only forming part of this pen, and the end of such pen at New York, held and directed by the hand of the writer, will communicate a motion to its point at New Orleans in exact correspondence with the characters formed by the hand of the writer.

Thus, if the writer at New York move the extremity of the conducting wire so as to write a phrase or his usual autograph, the point at New Orleans will there inscribe on the prepared paper the same phrase with the same signature annexed, and the writing of the phrase and the signature will be identical with that of the writer.

In the same manner a profile or portrait, or any other outline drawing, may be produced at a distance. The methods of accomplishing this depend, like the other performances of electricity in this application of it, on the alternate transmission and suspension of the current, and on its decomposing power; but these are at present more matters of curiosity than of practical utility.

Among telegraphic curiosities may be counted the various ciphers used by merchants, either to save space or to preserve secrecy. The following is a specimen of a New York mercantile cipher, in which each letter expresses a word or sentence. The dispatch to be sent consisted of sixty-eight words, as follows:

"Flour Market for common and fair brands of Western is lower, with moderate demand for home trade and export. Sales, 8000 bbls. Genesee at 5 dols. 12. Wheat, prime, in fair demand, market firm; common description dull, with a downward tendency; sales, 4000 bushels, at 1 dol. 10. Corn, foreign news unsettled the market: no sales of importance made. The only sale made was 2500 bushels at 67 c."

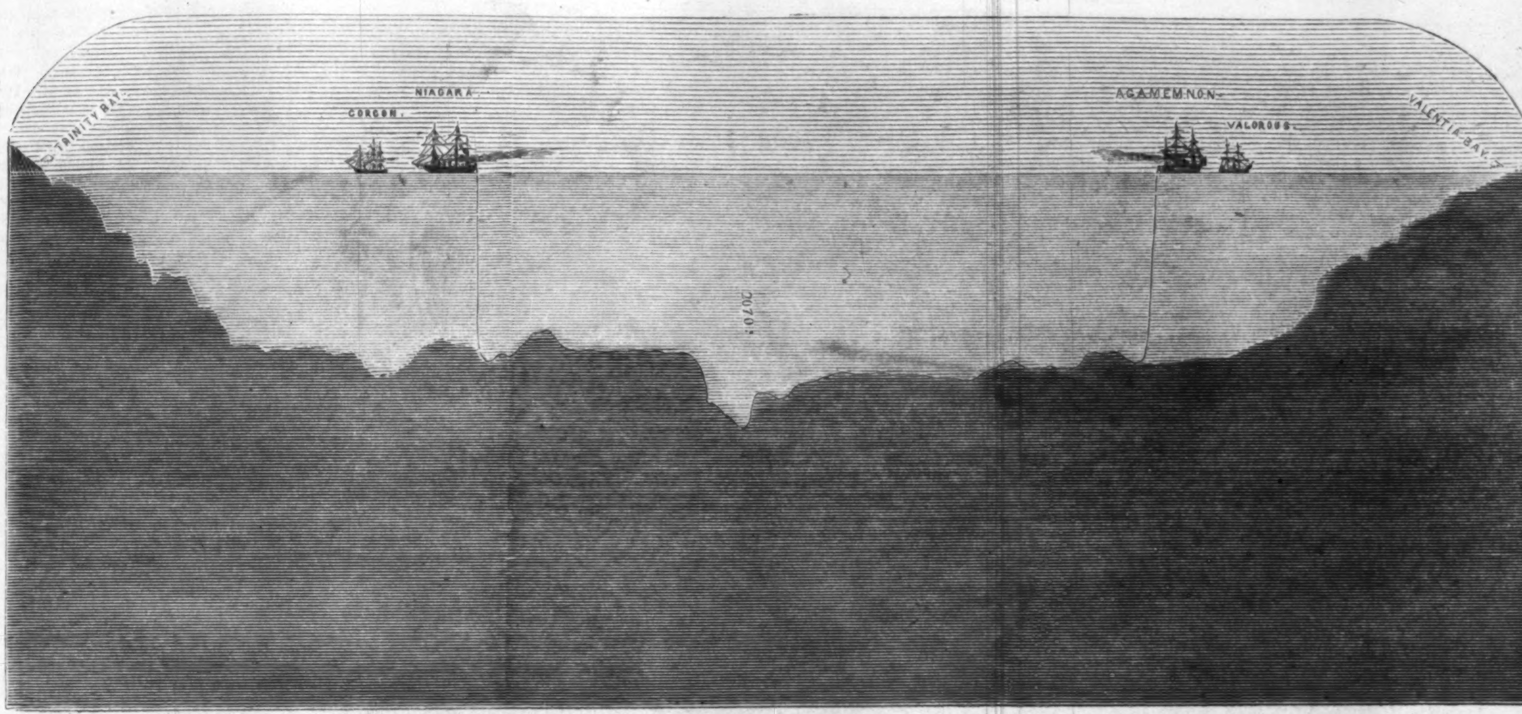
This dispatch, when converted into the verbal cipher, was expressed in nine words, as follows:

"Bad came aft keen dark ache lain fault adapt."

ENGLISH NEEDLE INSTRUMENT.

The Needle Instrument, of which, in its *double* form, we give an illustration, is that chiefly used in England. These make their signals by means of the deflections of magnetic needles, produced by the electric current.

This instrument consists of a galvanometer and a commutator, mounted in a case resembling in form and size that of an ordinary table time-piece. On the upper part is a dial, in the centre of which the indicating needles appear, like the hand of a clock, fixed upon an axis. Their play to the right and left is limited by ivory studs inserted in the face of the dial, a short distance on each side of the upper arms.



SECTION, EAST AND WEST, OF THE BED OF THE ATLANTIC—SHOWING THE LAYING OF THE CABLE ON THE TELEGRAPH PLATEAU.

The handles which work the commutator, also fixed upon an axis, are presented at the lower part of the case, under the dial.

Upon the dial are engraved the letters of the alphabet, the ten numerals, and one or two arbitrary symbols, under each of which is engraved a mark, indicating the motions of the needle, by which the letter or figure is expressed. These signals we give below the instrument.

The galvanometer, constructed as already explained, is attached to the back of the dial, the axis of its magnetic needle passing through the dial and carrying the indicating needle in front.

The latter is also usually magnetic, its poles being reversed in their direction with relation to those of the interior needle, the effect of which is, that the current transmitted through the galvanometer has a tendency to deflect both needles in the same direction. The indicating needle, however, need not be magnetic. If it be sufficiently light, being free from magnetism, it will be carried by the axis to the right or left against the studs, by the deflections of the galvanometric needle which plays within the coils of the galvanometer, to which it is always parallel.

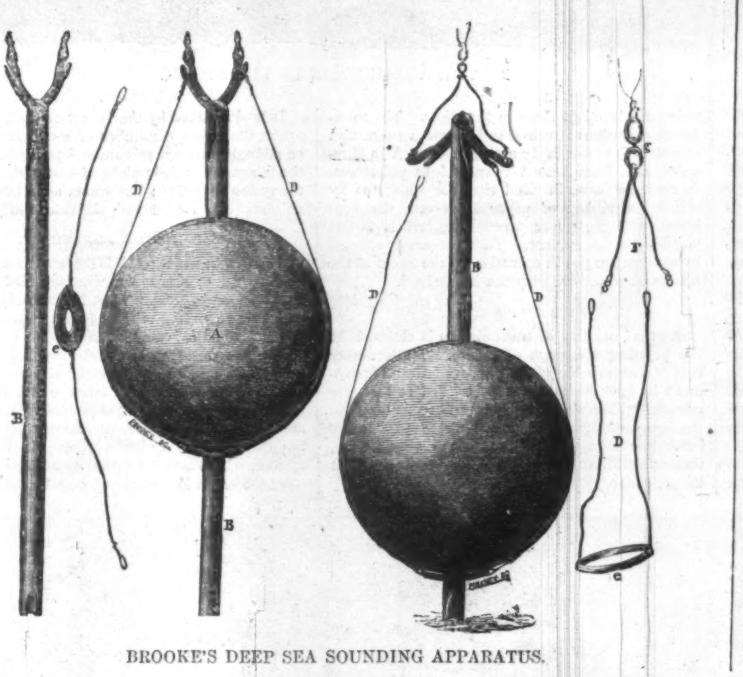
In connection with the instrument there are usually an alarm and a galvanic battery.

The double needle instrument is merely a repetition of the single needle, and is used only for greater celerity of transmission. It requires two wires, but both can be worked by one man.

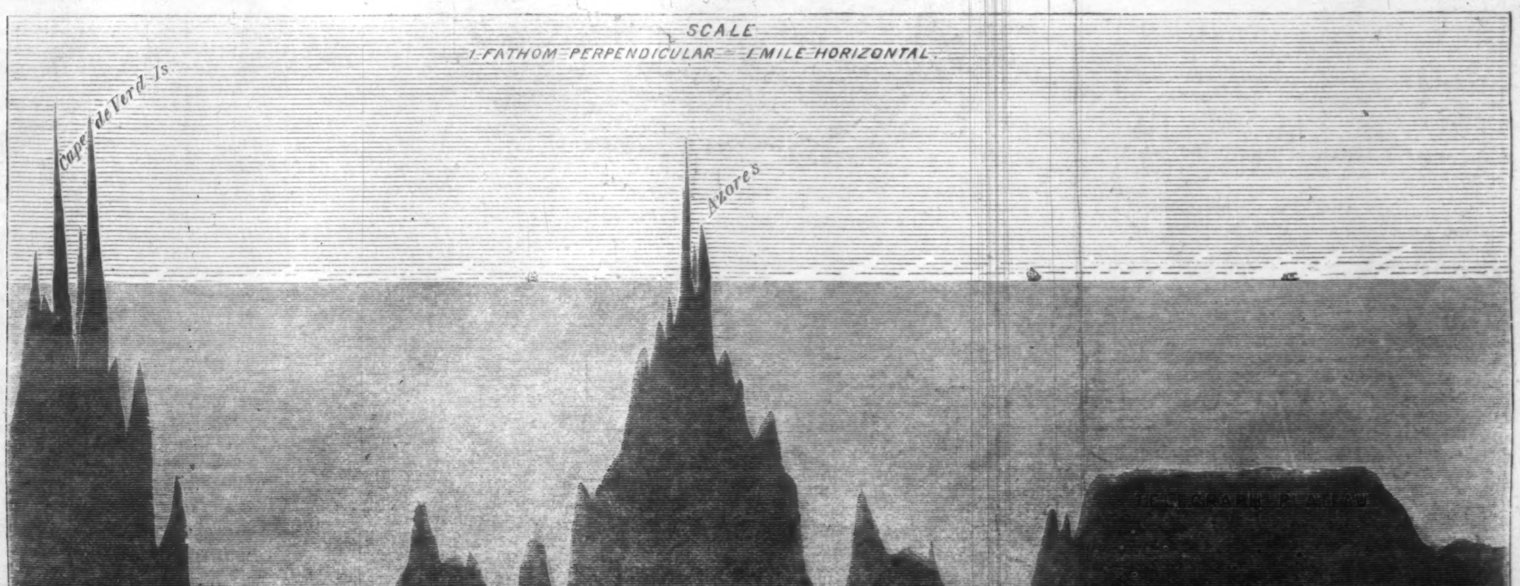
THE HOUSE INSTRUMENT.

The House Telegraph, the invention of Royal E. House, differs materially from all previously invented telegraphic instruments, printing messages in the ordinary Roman letters. Directly under a set of keys like those of the pianoforte is a shaft inclosed by a cylinder. This shaft is made to revolve rapidly by means of a treadle. The shaft and cylinder are so arranged that the cylinder can be arrested while the shaft still revolves. On one end of this cylinder is a brass wheel having fourteen teeth. A spring is so arranged that when the shaft and cylinder revolve it will alternately strike a tooth of this brass wheel and pass into an open space; thus alternately breaking and closing the electric circuit. On the cylinder two lines of teeth project, fourteen in each line, one for each tooth and each space of the circuit wheel. These teeth are immediately below the keys, so that by pressing down a key the motion of the cylinder is stopped. By making the cylinder revolve, the circuit is rapidly broken and closed, which continues till a key is depressed. On the key being released, the revolution goes on as before. The electrical pulsations produced by the breaking and closing of the circuit are conveyed to the magnet of the distant instrument, each pulsation causing the magnet to act.

The type-wheel—a wheel having the letters of the alphabet cut upon it—is made to revolve, but is so checked by an escapement-wheel that only one letter goes forward at a time. This escapement is connected by a lever with the piston of an air-chamber. This piston is caused to move horizontally backward and forward by means of compressed air admitted alternately on different sides of the piston. A valve attached to the magnet regulates the pressure of the air on the piston. Every breaking and closing of the circuit causes the magnet, piston, and escape to act, so that for every time the circuit is broken or closed the type-wheel is advanced one letter. If any letter of the



BROOKE'S DEEP SEA SOUNDING APPARATUS.



SECTION, NORTH AND SOUTH, OF THE BED OF THE ATLANTIC, THROUGH THE CAPE DE VERDS, THE AZORES, AND THE TELEGRAPH PLATEAU.

THE AGAMEMNON IN THE STORM.

type-wheel is placed in a certain position, and the key corresponding to it is depressed, raised, and again depressed, the circuit wheel at the transmitting station and the type-wheel at the receiving station make one revolution, bringing the letter back to its former position. Any other letter is brought into the required position by pressing down its key on the key-board of the instrument. The letter first brought into position is the dash. The type-wheel is stopped at the dash, after which the printing goes regularly on as the keys are depressed. Immediately before the type-wheel is the press, containing a narrow strip of paper. At the depression of a key the type-wheel stops, sets a crank in motion, which presses the paper forcibly against the letter opposite to it on the type-wheel. On the key being raised, the type-wheel revolves until the depression of another key, which again unlocks the press and prints a letter.

The electric current is used in this instrument to preserve equal time, that the letters in one machine may correspond to those in the other. The number of pulsations required to indicate a succession of letters is exceedingly unequal; from A to B requires one, from A to A twenty-eight pulsations. It must be borne in mind that the apparatus by which the ribbon of paper is moved, the type inked, and the paper pressed against it is not worked by the current. That process is effected by mechanism put in operation by the agent at the station at which the dispatch is received.

RATE OF PRINTING.

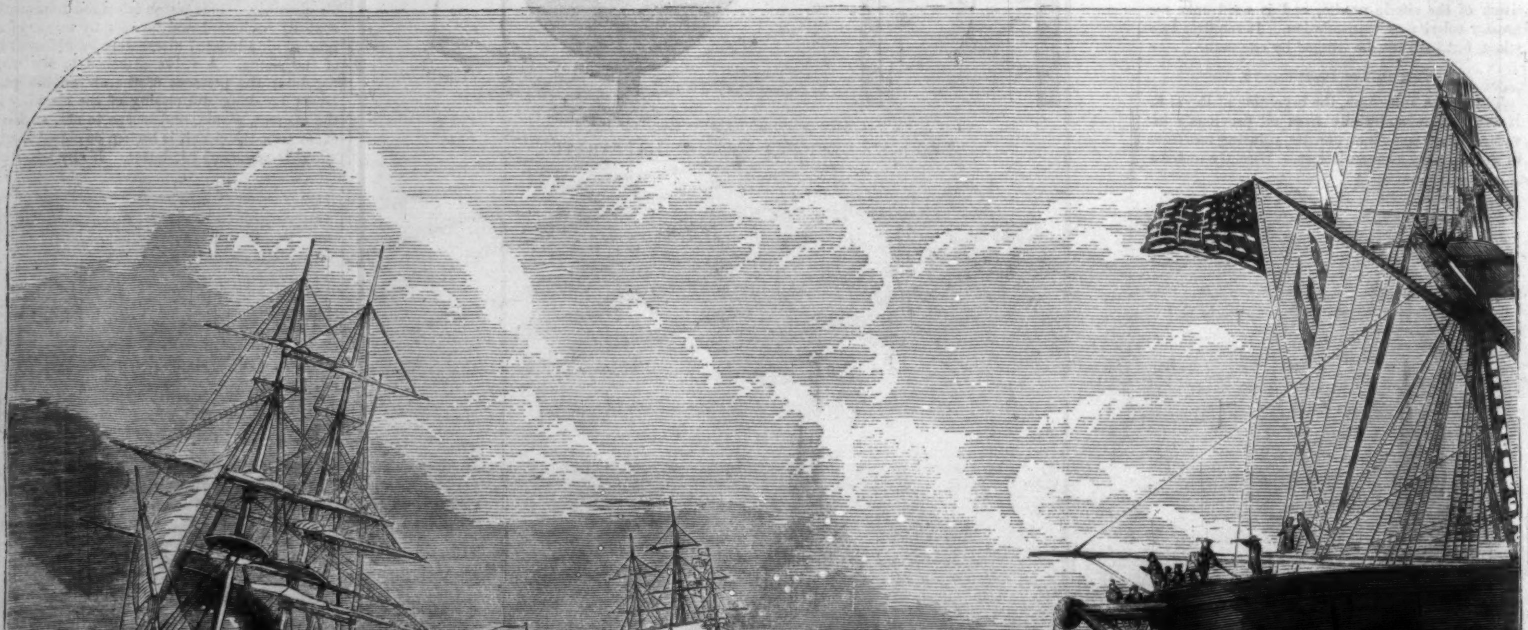
A great celerity of transmission is claimed for the printing telegraph of House. The ordinary rate of transmission of the improved House instrument is from 30 to 35 words, printed in full, per minute, which would be from 165 to 200 letters. Business-messages are sent at the rate of 200 to 250 letters per minute, and that in one case 365 letters, transmitted from New York, have been printed at Utica, distant 240 miles, in one minute.

It is also stated by the Directors that, accidents apart, the average number of words transmitted on a single wire per minute and printed in full by the telegraph at their place of destination, is from thirty to thirty-five; but when, as in newspapers, abbreviations are allowed, the rate is fifty.

THE HUGHES INSTRUMENT.

The Hughes Telegraph is the invention of David E. Hughes, of Kentucky, who obtained a patent in 1855 and in 1858. This, like the House Telegraph, is a printing telegraph, but in principle and in mechanism it is totally unlike that instrument.

The Hughes system of telegraphing combines not only all the advantages of all other existing systems, but reduces the labor which electricity has to perform to the lowest possible point. In all other systems it requires several distinct electrical impulses to form a single letter. In the House system, which is based upon the number of waves sent, the average number of impulses required to determine the intended letter is seven: in the Morse system, which is based upon the number and duration of the waves sent, the average is three and a half. To print a letter every closing or breaking of the circuit, so that every electrical impulse should determine a letter, has long been a desideratum, more particularly since the discovery that it requires an appreciable time to charge a long wire with electricity; so that on long circuits we should be obliged to send a less number of electrical waves in a given time than on a short circuit. On submerged cables this and other effects are still more marked, reducing the speed of transmission upward of two-thirds. If every wave, instead of every three waves, produced a letter, it is evident enough that the speed of transmission through the cable would be equal to that of the air-lines with the systems now in use, and that the speed of the air-lines would be increased two-thirds. The Hughes system uses but one electrical impulse per letter, and by the use of a new and exceedingly sensitive



SPLICING THE CABLE IN MID OCEAN.

magnet can work on lines of far greater length, and with a rapidity exceeding that of any telegraph now in existence.

To carry out the one-wave system, it is essential that the type-wheels of the different instruments should revolve at precisely the same speed, so that the same letter on each type-wheel should be opposite a given point at the same time. Clock-work governed by means of a pendulum would be too slow for any practical use. Instead of a pendulum, Hughes employs as a governor a vibrating spring. This spring allows the type-wheels to revolve with any desired degree of rapidity. This governor is dependent for its correct action on a law of acoustics, viz., "that a certain number of vibrations per second produces a certain musical tone; and if there are two or more springs of the same tone, they invariably give the same number of vibrations per second." If these springs by their vibrations are made to unlock an escapement, it follows that all instruments governed by springs of the same tone must revolve in exactly the same time. The type-wheels, thus governed, revolve at the rate of 100 revolutions per minute, and the average number of letters sent at each revolution being two, it follows that the speed of the instrument is 200 letters per minute, equal to about forty words.

This is about the speed that an ordinary operator touches the keys, but not by any means the utmost speed of the instrument, as the type-wheels would revolve with undeviating accuracy at a speed of 500 instead of 100 revolutions per minute.

The magnet of the Hughes instrument, which receives the electric current from the distant station, is a combination of a natural and an electro-magnet. The attractive power of the natural magnet, exerted through the electro-magnet, holds a small armature in contact with the poles of the electro-magnet. A spring attached to the armature is so adjusted as nearly to pull the armature away from the poles of the electro-magnet. The slightest change in polarity causes the spring to pull the armature away from its resting-place. The armature is restored to its place by means of a lever, which acts upon it at the instant it is pulled away from the electro-magnet's poles. This arrangement employs the current of electricity merely to effect a slight change in the force by which the armature is held to the magnet's poles, and it is so remarkably sensitive that the mere contact of a piece of zinc against a copper wire has been found amply sufficient to work the magnet. From its sensitiveness it requires scarcely a tenth of the battery-power used by the most sensitive of other systems.

Another wonderful and beautiful feature of this instrument is its power of writing both ways, sending and receiving messages at the same instant over one wire. This instrument thus doubles the capacity of the wire, making it do the service of two; transmitting with certainty and accuracy 200 letters each way per minute, an actual transmission of 400 letters, or 80 words, per minute. This result is accomplished by means of a peculiar arrangement of the batteries and magnets, so that the current from the transmitting station does not influence its own magnet, while it affects that of the receiving station, each magnet thus being placed under control of the distant operator.

The machinery which accomplishes results so astonishing is simple in the extreme. It consists mainly of four clock-wheels used to turn the type-wheel. These wheels are governed by the vibrating spring before explained. At the moment a current from the distant station enters the magnet the armature flies off, opens a detent which causes a small press to be locked to the wheel-work of the instrument, and then to press a strip of paper against the letter of the type-wheel opposite the press at that instant. A current is sent upon the line by means of keys arranged like those of a piano, and having the letters of the alphabet engraved upon them. At the moment one of these keys is depressed the magnet of the receiving station is made to act, and the press to print the letter corresponding to the touched key. The receiving operator has nothing to do but to tear off the messages as they arrive.

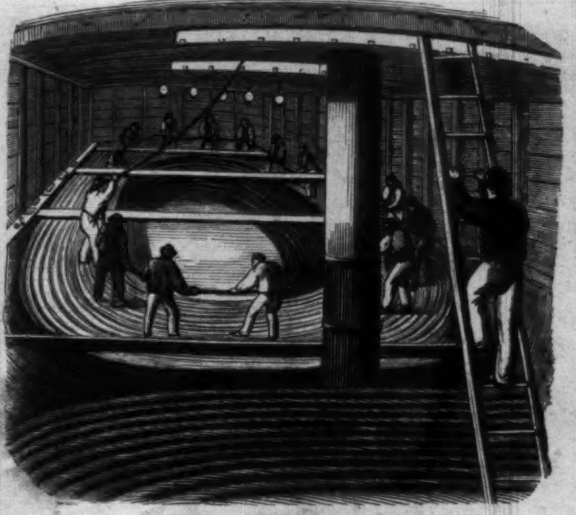
RATE OF THE MORSE INSTRUMENT.

In this instrument it will be remembered that the transmitting agent plays upon a key-commutator, the letters being severally expressed by repeated touches of the key succeeding each other, after longer or shorter intervals. At the station receiving the dispatch the armature of the electro-magnet moves simultaneously with the transmitting key, and at each of its motions toward the magnet it produces a distinctly audible click. The receiving agent acquires by practice such expertness and quickness of ear that, by listening to this clicking, he is able to interpret the dispatch, and to write it down or dictate it to a clerk without using the apparatus for impressing it upon the paper ribbon.

Different telegraphists acquire this power of oral interpretation of the dispatches with different degrees of facility and precision; but all are more or less masters of it. So much so that, in most cases on the American lines, it is by the clicking of the magnet that the messages are taken down, being afterward corrected, if necessary, by comparison with the indented paper ribbon.

According to Mr. Turnbull, the average celerity of transmission of this telegraph is from 135 to 150 letters per minute.

In a report made by Mr. O'Reilly it is stated that the average rate of transmission is from 20 to 23 words per minute. Since it is generally estimated that the average length of telegraphic words is five letters and a half, this would amount to 110 to 127 letters per minute.



COILING THE ATLANTIC CABLE.

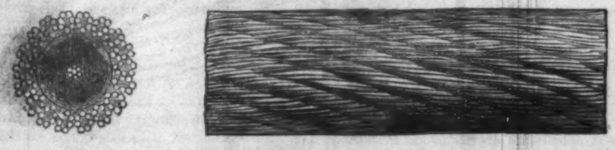
Mr. O'Reilly adds, however, that a "higher rate of transmission could be obtained, as an expert operator can indent his Morse characters faster than most men can write the words they express with a pen or pencil."

We may perhaps take 150 letters as a fair estimate of the rate of transmission, and it follows, therefore, that this telegraph is more rapid than the English double-needle telegraph in the ratio of about three to two, and since the latter employs two wires with their accessories, while the former employs only one, it follows that the transmitting power of each wire with the Morse telegraph is three times as great as with the English double-needle instrument.

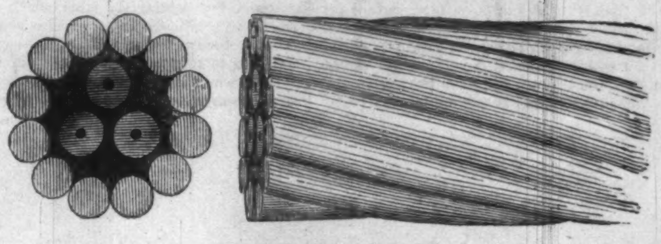
SUBMARINE TELEGRAPHING.

We come now to the consideration of submarine telegraph wires. Electrical communication over land once established, there remained little doubt in the minds of the leading men in these enterprises that properly insulated wires would convey intelligence over the bottoms of rivers and seas. Dr. O'Shaughnessy, of Calcutta, so early as 1839, succeeded in depositing an insulated conducting wire, attached to a chain cable, in the River Hoogly, by which the electric current was transmitted from one bank of that river to the other. No use was made, however, of this line. In 1842, on October 18, Professor Morse stretched a wire from the Battery (New York) to the shore of Castle Garden. A ship cast her anchor upon it and destroyed the insulation to that degree that the Professor was able to produce through it only a few illegible marks.

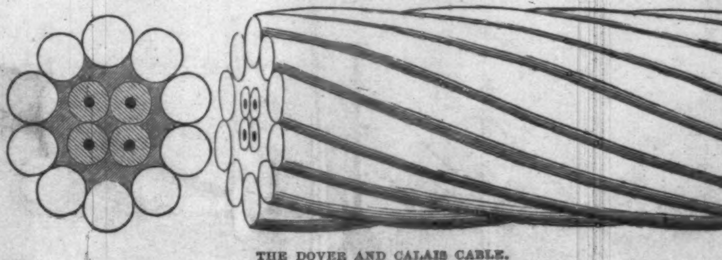
Somewhat discouraged, in truth, but, of course, firm in confidence, Professor Morse applied his mind to the transmission of the electric current across rivers without the aid of wires. This experiment was successfully performed, and the current sent across the canal at Washington without intervening wire, in presence of many members of Congress and distinguished persons, in December, 1842. Nothing came of it.



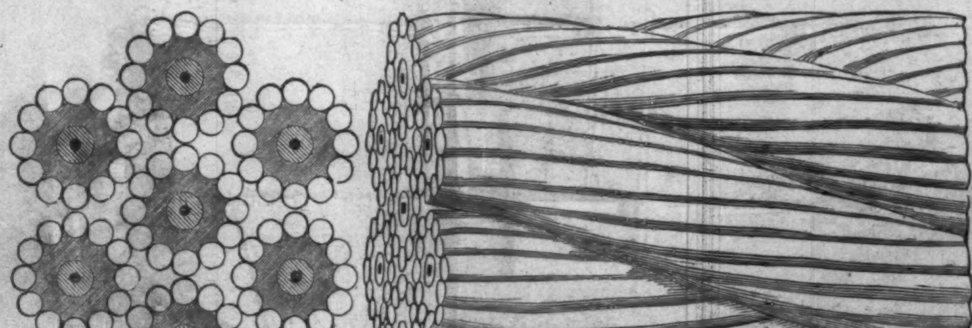
THE ATLANTIC CABLE.



THE NEWFOUNDLAND CABLE.



THE DOVER AND CALAIS CABLE.



THE ORFORDNESS AND HAGUE CABLE.

THE MISSISSIPPI CABLE.

A PROPHECY.

But Professor Morse was so well satisfied that his failure at Castle Garden was only a step to the success of submarine telegraphs that he wrote to the Secretary of the Treasury, on 10th August, 1843: "The practical inference to be drawn from the law [which he had developed] is, *that a telegraphic communication may be established across the Atlantic. Startling as this may now seem, the time will come when this project will be realized.*"

THE FIRST SUBMARINE TELEGRAPH.

America has the honor of having the first actually working submarine wire. In the year 1846, when Professor Morse was overwhelmed with work in establishing land telegraphs and defending his rights, Colonel Colt and Mr. Charles Robinson, of New York, laid a submarine telegraphic wire across from New York to Brooklyn, and from Long Island to Coney Island. This wire, which was laid for the purpose of obtaining early marine news, worked for some time to the public satisfaction.

It was not till 1850 that a project to unite England and the Continent by a submarine cable was broached in London. The British Government, applied to for a grant of money, declined. Exclusive privileges were afterward granted to the undertakers, and in 1851 the first submarine telegraph cable was laid from Dover to Calais—length, 25 miles. Since then the number of submarine cables has greatly increased, as the following table will show:

LIST OF SUBMARINE CABLES.

Cables.	Miles.	Wires.	Date.
Dover and Calais	25	4	1851
Dover and Ostend	75	6	1852
Holyhead and Howth	65	1	1852
Orfordness and the Hague	115	3	1853
Port Patrick and Donaghadee	13	6	1853
Second cable, do., do.,	13	6	1853
Italy and Corsica	65	6	1854
Corsica and Sardinia	10	6	1854
Denmark, across the Great Belt.	15	3	1854
Denmark, across the Little Belt.	5	3	1854
Denmark, across the Sound	12	3	1855
Across the Frith of Forth (Scotland)	4	4	1855
Varna and Balaklava (across the Black Sea)	340	1	1855
Balaklava and Eupatoria	60	1	1855
Across the Danube, at Shumla	1	1	1855
Across the Hoogly River	2½	–	....
Messina to Reggio	5	1	1856
Across the Gulf of St. Lawrence.	74	1	1856
Across the Straits of Northumberland, Prince Edward Island	10½	1	1856
Across the Bosphorus, at Kandili	1	1	1856
Across the Gut of Kanso, Nova Scotia	—	3	1856
Six cables across the mouths of the Danube, at the Isle of Serpents, each one mile long and having one conductor	6	6	1857
Across the Mississippi at Paducah	1	1	1851
From Petersburg to Cronstadt	10	1	1856
Across the St. Lawrence, at Quebec	—	1	1855
Across the Soland, Isle of Wight (England)	3	4	1855
Across the Atlantic, from Trinity Bay to Valentia Bay	1950	7	1858
Small river crossings	20	–	....
Total length of submarine cables	2900		

Among our illustrations will be found views of several of the submarine cables now laid. To manufacture these cables has become a regular and vast business, and no little ingenuity and inventive skill has been exercised to bring them to their present state of perfection.

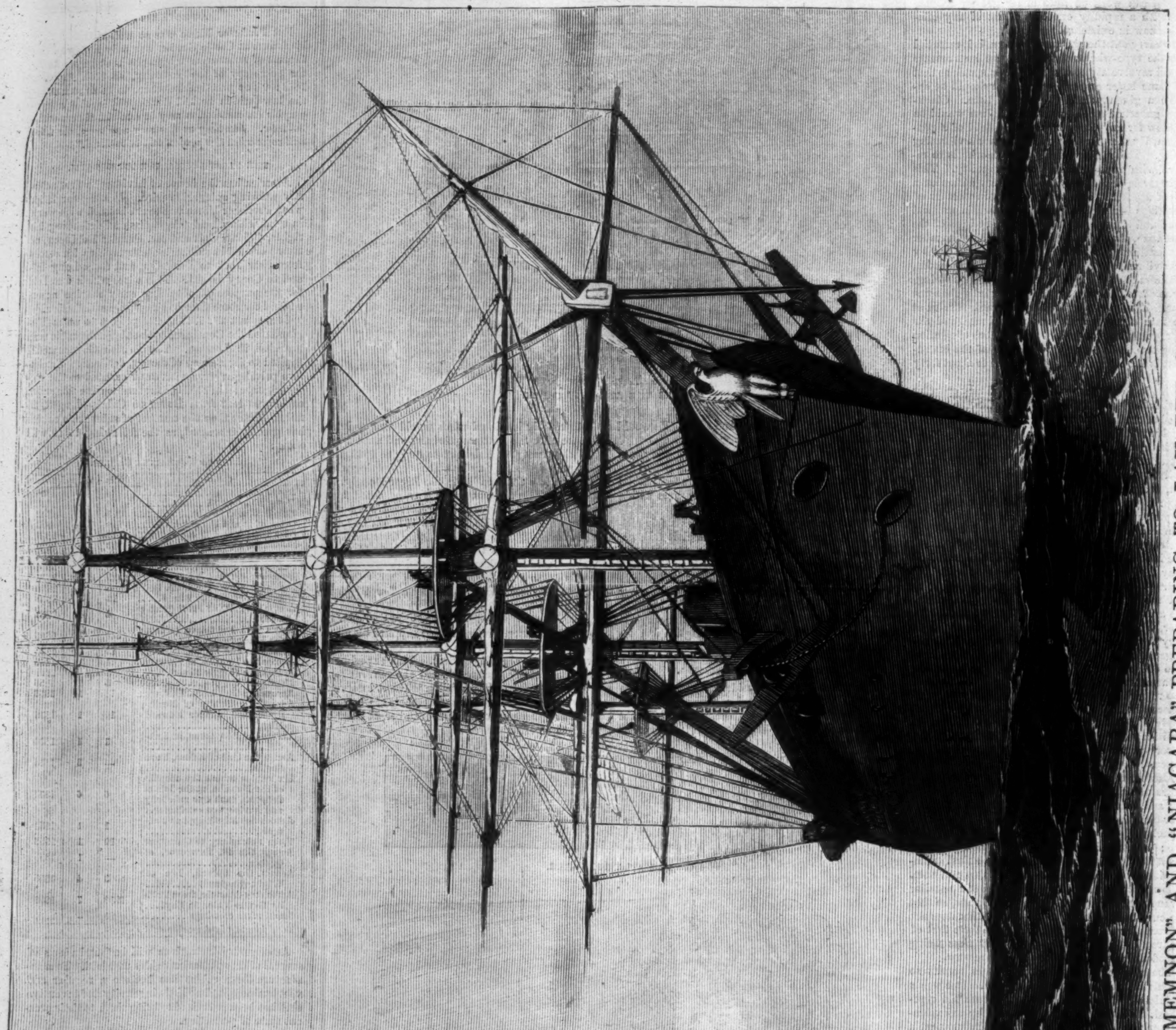
HOW SUBMARINE CABLES ARE MADE.

The conducting wires inclosed in these cables are usually of copper, having a diameter of the sixteenth of an inch. Each wire is first separately covered with two coatings of gutta percha. Each successive coating increases the thickness by a certain fraction of an inch. The object of laying on this succession of coats of the gum is to guard against accidental defects which might render the insulation imperfect. If such a defect happened to exist at any point of the first coat it would be covered by the second, the chances against a defect occurring at the same point of both coatings amounting to an impossibility.

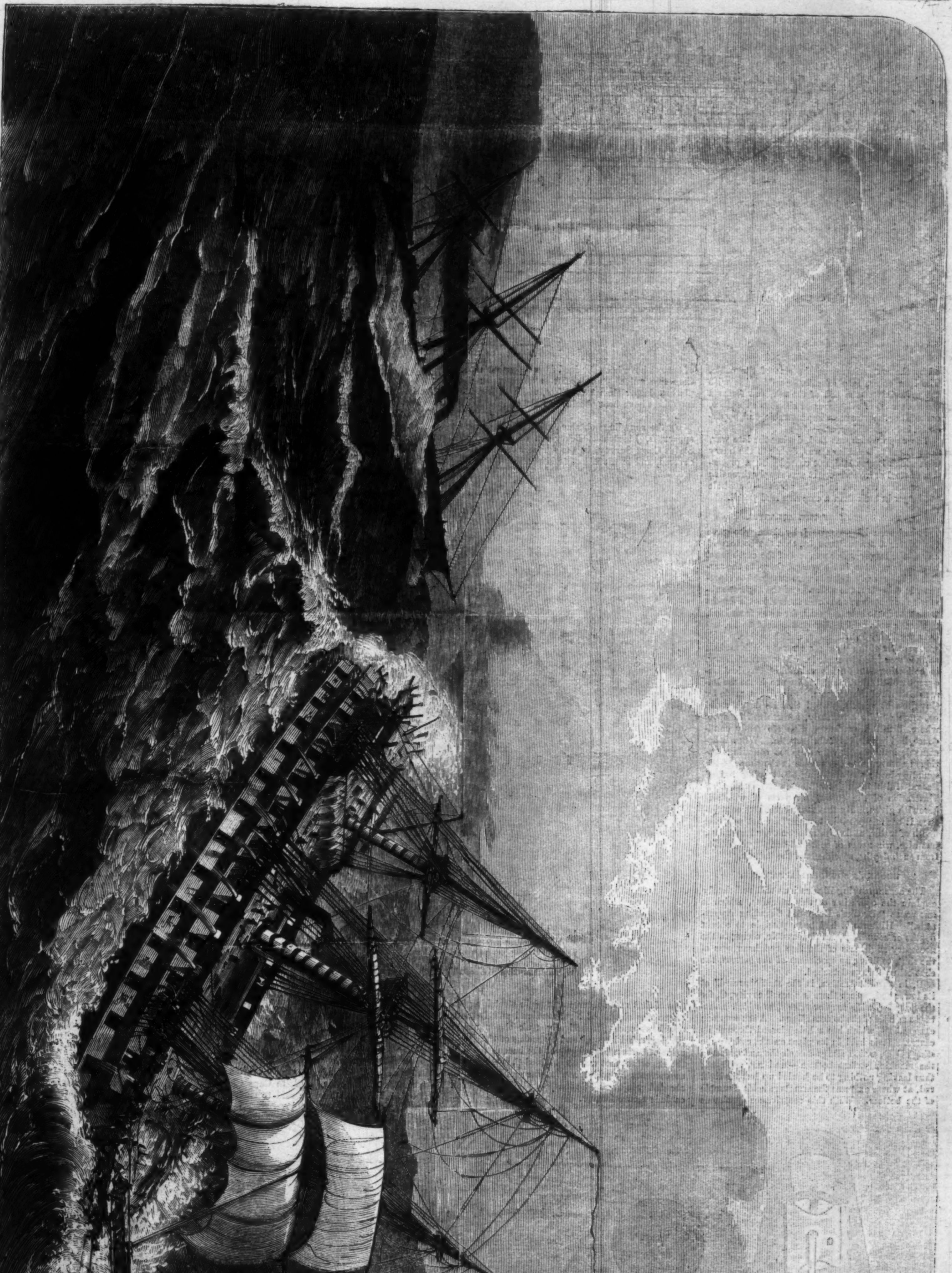
The conducting wire thus invested, or so many of them as it is intended to deposit, are then twisted together and surrounded with a mass of spun yarn, soaked with grease and tar, so as to form a compact rope. Around this rope are then twisted a number of stout iron wires, sometimes coated on the surface with zinc, or, as it has been called, galvanized. The cable is then complete.

Sixteen miles of a cable intended for the Irish coast was lost in 1851, in 150 fathoms (900 feet) of water. After lying there nearly three years it was recovered by means of a powerful apparatus worked by a steam-engine placed on the deck of a steamer. The operation occupied four days; for, from the great force of the tide, which runs at the rate of six miles an hour, it was found impossible to work except at the times of high and low water. The cable was also imbedded in sand, so that the strain required to drag it up was occasionally very great.

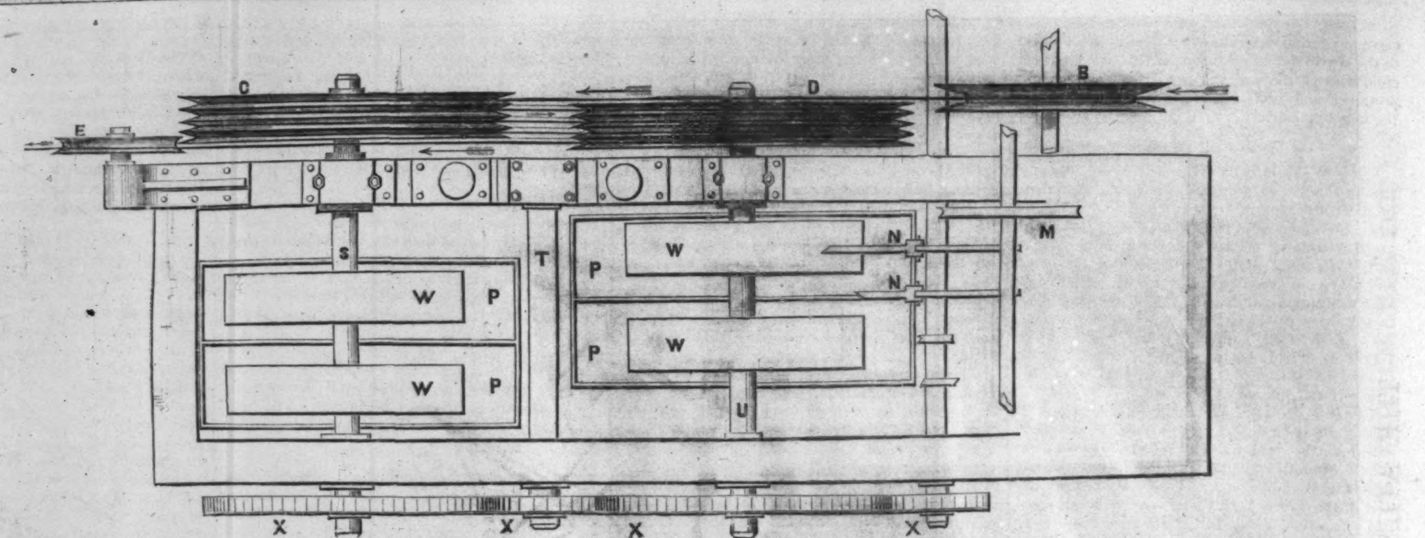
The recovery of this cable has so far solved the question of the durability of submarine telegraphs. It was found nearly as sound as when laid down. There was a slight corrosion in certain parts which appeared to have been imbedded in decaying sea-weed—the parts imbedded in sand were quite sound. The cable, on being tested, was found as perfect in insulation as when laid down. It has been found that the decomposition effect-



THE ATLANTIC TELEGRAPH EXPEDITION—THE "AGAMEMNON" AND "NIAGARA" PREPARING TO LAY THE CABLE IN MID OCEAN.



THE ATLANTIC TELEGRAPH EXPEDITION—THE "NIAGARA" AND THE "AGAMEMNON" IN THE GALE.



EVERETT'S PAYING-OUT MACHINE.

ed by the water increases the size of the cable. The iron enters into chemical combination with the materials of the bed of the sea, and forms a concrete mass of calcareous or silicious substance, embedding the wire in an impenetrable, and, apparently, indestructible coat.

The cable which was laid, during the late war, from Varna to Balaklava, was, owing to the hurry with which it was laid, not coated with a protection of steel or iron wire. It was simply three fine copper wires encased in gutta percha—the whole not larger in bulk than a common lead pencil.

THE BOTTOM OF THE ATLANTIC.

It had been long supposed, by those who gave the matter a serious thought, that the bottom of any of the larger water surfaces of the earth must bear some relation, in its general shape, to the surface of the earth. Islands were supposed to represent, in this plan, the summits of the highest submarine mountains; and down their sides the depths were thought to increase until, far away from land, the ocean was confidently pronounced to be, not only poetically but literally, unfathomable. This was another of the "vulgar errors" which modern science was fated to explode. Lieutenant Maury, in collecting data for his valuable "Physical Geography of the Sea," found reason to doubt the immense depth of the Atlantic. Soundings, made by Government vessels, proved that its depth could be, more or less accurately, ascertained in spots where, hitherto, mariners, with too ready confidence, had believed it unfathomable. When it became desirable to get very deep sea soundings various improvements were made in the shape of the sounding-lead; the crowning effort being that of Passed-Midshipman (now Lieutenant) Brooke, an illustration of the component parts of which is herewith given. By this most ingenious contrivance it became possible to ascertain not only the depth of water, at depths of even over two miles, but also, what was of material benefit, to obtain, from such depths, specimens of the bottom.

BROOKE'S SOUNDING APPARATUS.

The accompanying illustrations will sufficiently explain the operation of this machine, which is known as "Brooke's Deep Sea Sounding Apparatus." Hitherto it had been possible to obtain depths or soundings, but impossible, owing to the necessary slightness of the line and heaviness of the shot, to bring up specimens of the bottom, the shot being always detached.

B, in our illustration, is the staff "armed" at its lower end, where there is a small cavity, C, for the purpose, with soap or tallow, to which armature a sample of the bottom clings. A is a common cannon-ball, which has a hole pierced through its centre. It is held in its place on the rod by the slings D D, which slings detach themselves when the machine strikes bottom—and not without; thus leaving nothing to be hauled up but the light rod, at whose extreme the armature holds a sample of the bottom. With this contrivance specimens of bottom have been obtained from a depth of more than two miles. The ocean is nowhere on the plateau deeper than 12,000 feet, while at its side soundings have been obtained to a depth of 24,000 feet.

By the soundings obtained with this ingenious apparatus, Lieutenant Berryman of the United States Coast Survey, in the summer of 1853 discovered, and in the fall of 1856 verified, the position of that vast subterranean plain stretching between the shores of Newfoundland and Ireland, which at once prophetically took the name of "Telegraph Plateau," and by means of the specimens of bottom brought up at the base of the rod, the important fact was ascertained that there were no currents by which a wire once laid would be abraded or injured. So that, once laid, a telegraph cable is secure forever.

THE TELEGRAPHIC PLATEAU.

An ingenious artist, Mr. Wells, has executed for us the section of the bed of the ocean which accompanies this article. It represents the Atlantic ocean in section, the spectator looking from east to west or from west to east. The design of the drawing is to show how singularly this elevated submarine prairie is adapted to the purpose to which it is now to be applied. The upper illustration on the same page presents a view of the surface of the great oceanic plateau, or table-land, along which the telegraph wires have just been successfully laid.

This plateau, prairie, or "steppe," as Lieutenant Maury calls it, extends in unbroken line from Cape Race, in Newfoundland, to Cape Clear, in Ireland. Indeed it may be said to encircle the earth; for it can be followed through the British Islands into the great range which divides the Arctic waters from the waters flowing into the Baltic and other seas, crossing the continent of Asia, disappearing under the Pacific, peeping up in the Aleutian Islands, and again reappearing in the great North American range which divides the waters of the Pole from those of the great Lakes.

WILLIAM E. EVERETT, ESQ., ENGINEER U.S.N.

It is nowhere in the Atlantic above ten or twelve thousand feet below the surface of the water, while on either side of it, depths of 24,000 feet are supposed or known to exist. The whole plateau has been accurately surveyed by Lieutenant Berryman, and sounded at regular intervals with Brooke's sounding apparatus, so that its surface can be mapped with more accuracy than the interior of the continents of Africa or Australia.

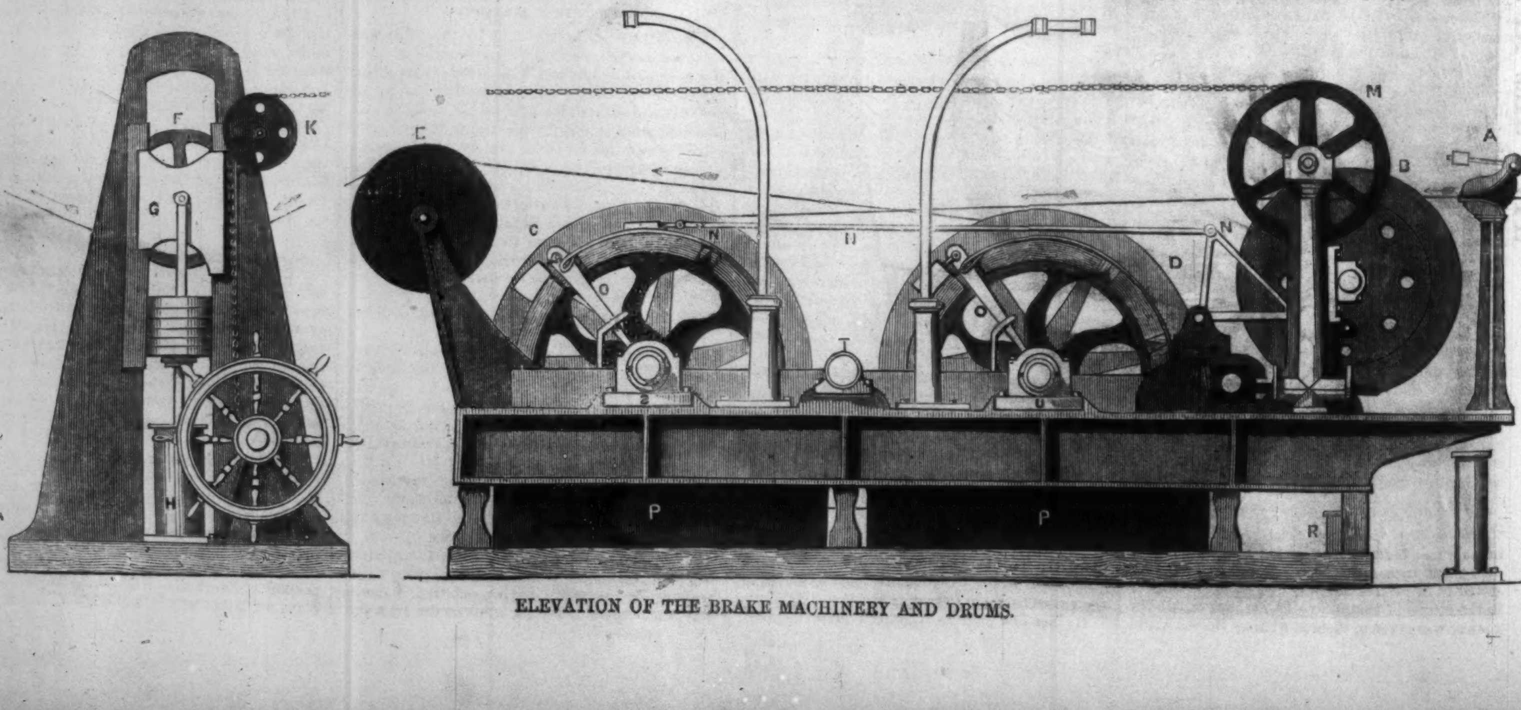
It appears that the depth of water on the plateau nowhere exceeds two miles; and that there is, from a point a little to the eastward of the middle, a gradual slope toward each terminus, with but few irregularities. Along this ridge, so providentially arranged to facilitate the greatest achievement of modern science and energy, there appears to be no rocks or jagged points to endanger the safety of a cable; nothing, in fact, but a deposit of soft mud, which, under the microscope, proves to be composed of myriads upon myriads of minute shells, each separate and entire—thus proving that there is not, in those depths, even sufficient current or motion to destroy, by abrasion, these fragile structures.

It is, we know, a vast cemetery, covered from end to end, to the depth of several feet, with dead shell-fish of microscopic size. Some of these have been brought up, and exhibit the most lovely forms, showing, by their sharpness and perfect outline, that no current exists where they lie, that no shocks disturb them, that they rest in a death-like stillness very well befitting so huge a grave.

With the discovery of the plateau the laying of a telegraphic cable along its depth became a prospective fact. Even the least sanguine were compelled to acknowledge that this achievement was only a matter of time. Thanks to Yankee enterprise and perseverance, and the liberality of the governments of the United States and Great Britain, the time has been shorter than many supposed.

ORIGIN OF THE ATLANTIC TELEGRAPH ENTERPRISE.

On an evening in March, 1854, a small party of gentlemen were assembled in the parlor of Cyrus W. Field, 84 Gramercy Park, New York. There were present, the host, Cyrus W. Field, his brother, David Dudley Field, an eminent lawyer, Professor Samuel F. B. Morse, Peter Cooper, Moses Taylor, Marshal O. Roberts, and Chandler White, the last four eminent merchants. The subject of a transatlantic telegraph came up in course of conversation; was discussed, with maps upon the table; and the assembled party there and then formed themselves into a Company, to be called "The



ELEVATION OF THE BRAKE MACHINERY AND DRUMS.

New York, Newfoundland, and London Telegraph Company," and determined to devote themselves to the successful achievement of this, the greatest enterprise of the age. Peter Cooper was made president, and Professor Morse vice-president, of the new Company.

CYRUS W. FIELD.

Cyrus W. Field, who at once took the leader's part in the new enterprise, and who has so entirely identified himself with it, that, in all future time, his name will be a synonym of this, the greatest triumph of the nineteenth century, is a perfect specimen of the American business man, and a type of those practical minds, joined with vast conceptions, that have raised our people to their present proud pinnacle of superiority among the nations of the earth. His father is the Rev. David D. Field, pastor of the Congregational Church at Stockbridge, Massachusetts, where he still performs his sacred duties.

Cyrus is one of six brothers, each of whom is distinguished for superior natural ability and high moral worth. The name of David Dudley Field, the eldest brother, is familiar throughout the Union for his legal ability, and, as the author and originator of the "New York Code," has secured a lasting reputation, which will identify his name with the great minds of the nineteenth century. Mathew Dickenson Field and Jonathan Edwards Field are leading lawyers in their native State, and have been recipients of some of the highest honors of the Commonwealth. Stephen Johnson Field is at present one of the Supreme Judges of California. Henry Martyn Field, the youngest brother, is an eminent clergyman, and editor of the New York *Evangelist*. Cyrus West, who is the youngest brother save Henry, was born at Stockbridge, in the year 1819. Upon arriving at an age to commence business he came to New York, and made his first essay under the guidance of A. T. Stewart, the eminent merchant of Broadway. Untiring faithfulness in the discharge of all his duties was characteristic of his conduct; and only a few years elapsed before he was at the head of one of the largest houses in the Union engaged in the manufacture and sale of paper. Some four years ago—and, as we have already stated, in a social circle at Mr. Field's house—the idea of the oceanic telegraph was discussed, and Mr. Field at once became inspired with the idea of its practicability, and turned the whole energies of his active mind to bring about the result.

The preliminary labor on this continent having been thoroughly accomplished, Mr. Cyrus W. Field started for Europe. Few encouraged him in his expectations; all personally wished him well. On his last trip across the Atlantic, when leaving a number of his friends, one said, "When shall we see you again?" "Not," returned Mr. Field, "until I have laid the cable!" Such was the spirit of confidence which maintained under all the discouragements which beset his path. Failure never cooled his ardor, or lessened his abiding faith in a final triumph. In the third trial to lay the cable, it will be remembered that the cable, from some unexplained cause, untwisted at the stern of the *Agamemnon*, and the hearts of the most sanguine despaired. In the midst of the gloom occasioned by this disaster, the news reached us that "Mr. Cyrus W. Field is still sanguine of success." The terrible storm followed that nearly sent the noble war vessel and its valuable freight to the bottom of the sea; but when she arrived in port Cyrus W. Field was the first to hail her commander, and the most active to have immediate preparations made to "try again." Such energy, such determination to triumph, has an inspiration about it that thrilled through the hearts of all who were engaged in the enterprise; it communicated itself to the commander, officers, and men attached to the ships engaged in the expedition, and made them all work as one man, throwing into their labors a religious fervor that partook of the sublime. When the possibility of laying the cable had ceased to be discussed—when success or discouragements were alone indulged in—when it was deemed naturally impossible to unite the continents by the electrical current—when, in fact, the subject had ceased to occupy the public mind, save as a reminiscence of the past—the joyful announcement was made that "The cable is laid!" The heart of the whole nation thrilled at the news, and there went up rejoicings to Heaven more universal, more solemnly thankful, than have ever been called forth by any human event—the mightiest triumph of the nineteenth century was accomplished—one equal to the civilization and grandeur of the age.

Mr. Field is about thirty-nine years old, and looks younger, if possible. He has a light, lithe body, all muscle and nerves, and no flesh, five feet eight inches high, and weighs perhaps 140 pounds. His features are sharp and prominent; a nose that almost exhausts his face; eyes small, sunken, gray or blue, and apparently half closed; a large forehead, and a full head of auburn hair. There is a youthful, almost boyish appearance about him, that makes him seem younger than he really is. There is little of the impressiveness of figure and manner about him that distinguish his brother Dudley, of the New York bar.

The necessary preliminaries as to incorporation, etc., having been taken, the first step in the new enterprise was to obtain the authority and assistance of the Government of Newfoundland. The two Fields and Mr. White immediately proceeded to St. Johns, to endeavor to consummate those necessary preliminaries, by the laying of a line of telegraph across three hundred miles of the wilderness of Newfoundland, and stretching a submarine cable across the tempestuous Gulf of St. Lawrence.

SIR ALEXANDER BANNERMAN.

The worthy Governor, Sir Alexander Bannerman (whose portrait will be found in this sheet), met them in a spirit fully their own. Having stated their desires, he promised them an answer in the course of that day. In an hour or two the answer was given to them in writing, that he would immediately send in a special message to the Legislative Assembly, then in session, recommending them to pass an act of incorporation, with a guaranty of the interest on the Company's bonds to the amount of £50,000, and a grant of fifty square miles of land on the island of Newfoundland, to be selected by the Company. These terms the Legislative Assembly finally agreed to.

Sir Alexander Bannerman, who thus so eminently aided by his countenance and influence the early progress of the great enterprise, and thus worthily connected his name with it, is a Scotchman by birth, of a very ancient family, their surname being one of the earliest which was assumed in Scotland. He is heir-presumptive to a baronetcy conferred on an ancestor of his by Charles the Second, in 1682. His cousin, the ninth baronet, now holds the title. Sir Alexander was born in Aberdeen in 1769.

The government of the Island of Prince Edward falling vacant about the latter end of the year 1851, on the death of Sir Donald Campbell, the then Colonial Minister, Earl Grey, on Lord Panmure's suggestion, offered Sir Alexander the government of that colony.

He left Prince Edward Island on the 10th of June, remained in the United States for several months, and arrived at New Providence on the 12th October, where he assumed the government of the Bahamas in the beautiful town of Nassau, and continued to administer it for upward of two years, when he left it to take charge of the government of Newfoundland. He may have difficulties to encounter in that important colony; but it is to be hoped that the administration of his government may prove as successful there as it was in Prince Edward Island and the Bahamas.

THE FIRST FAILURE.

Mr. Field immediately returned to New York, ordered a cable, and began preparations for laying it across the Gulf of St. Lawrence. On August 24, 1855 (a Friday, ill-omened day!), the first and unsuccessful attempt was made to lay this cable. The expedition met with bad weather, and after having, with much difficulty, laid 40 of the necessary 150 miles of the cable, they were obliged to cut it to save the vessel from foundering.

A few blows of the axe accomplished the sad work, the vessel pitched forward as though she would bury herself in the waves, and 40 miles of the cable lay at the bottom of the ocean. Thus did the war of elements set at naught the energy, enterprise, industry, and ambition so creditably displayed by the projectors of this great work. Thus man proposes, thus God disposes!

The cable, of which we give a sectional view, was manufactured in London. The process of manufacturing was as follows: The insulated copper wires are first laid round a centre core of hemp, the exterior and spaces between each wire being wormed with hemp yarn so as to form a perfect circular rope or cable. It is then provided with another covering of hemp yarn, the whole of the yarn used being soaked in a preparation of Stockholm tar, pitch, oil, and tallow. It then receives its outside covering of twelve No. 4 gauge iron. The whole of this process, except the insulation of the wires, is carried on at one time by extensive and ingenious machinery erected for the purpose, and cables can thus be manufactured of any combined length that can ever be required.

Our illustrations show the various phases of this unfortunate expedition. Undismayed by the catastrophe, Mr. Field quietly returned from the disastrous trip, ordered a new cable, and then set to work vigorously for the recovery of the one at the bottom of the sea. Contrary to all expectation he was successful, and the Company, by his sagacity and indomitable perseverance, was secured against any material loss. The following year, 1856, the cable was successfully laid. It is 150 miles long, and weighed 1½ tons per mile. The Company then obtained grants and charters for lines from Prince Edward Island, Nova Scotia, New Brunswick, Maine, and Canada.

THE ATLANTIC TELEGRAPH COMPANY.

In order to induce English capitalists to contribute to the undertaking, it was thought expedient to incorporate a new Company in England for the purpose of establishing the submarine line between Newfoundland and Ireland; and Mr. Field, in 1856, went to England and succeeded in organizing that Company under the name of "The Atlantic Telegraph Company," the two companies binding themselves together by articles of agreement to operate in connection.

The "New York, Newfoundland, and London Telegraph Company," connecting New York with Trinity Bay, had secured to them by charter the following advantages:

The exclusive privilege for fifty years of running a telegraph across that island and through any of the adjacent waters. They also obtained an appropriation of twenty-five thousand dollars for the construction of a bridle-path over the southern portion of the country, which was considered indispensable for the regulation and repair of the telegraph. In addition to this they were secured the interest on two hundred and fifty thousand dollars for twenty years, and a present of fifty square miles of land, which the Company were allowed the liberty of selecting in any part of the island.

The shares of the "Atlantic Telegraph Company," at $5000 each, were subscribed in England and America through Mr. Field's efforts, to the amount of the entire original capital, £350,000, or $1,750,000. They were distributed in the following manner:

One hundred and one in London, eighty-eight in America, eighty-six in Liverpool, thirty-seven in Glasgow, twenty-eight in Manchester, and the remainder in other parts of England. The capital, however, had to be subsequently increased to $2,500,000, to meet the failures that occurred in the various attempts to submerge the cable.

By act of Congress, approved March 3, 1857, the United States Government agreed to furnish two ships of war, to aid in laying the cable; and farther, a subsidy of $70,000 per annum for twenty-five years was granted to the Atlantic Telegraph Company, provided that during that time the dividends of the company did not exceed 6 per cent. The United States Government also reserved to itself the right, after ten years, to terminate said contract upon giving one year's notice to the parties to it.

On the other hand, the British Government, by act of Parliament, which received the royal assent July 27, 1857, agreed to aid by vessels in submerging the cable, and by money grant of equal amount with the United States grant. Each Government possesses equal privileges as to the transmission of messages; and Government messages have the priority over all others.

These matters settled, no time was lost in preparing a cable. After mature consideration the cable, part of which is now successfully submerged, and an illustration of which is given herewith, was constructed in London and Liverpool.

THE ATLANTIC CABLE.

As, in the opinion of the highest authorities, the only difficulty to be apprehended was in the laying of the cable, and as it was quite certain that no anchors could interfere with it when it lay on the bottom of the sea at a depth of a mile or two, the problem proposed to the makers of the cable was to combine in the highest degree strength with flexibility. After numerous experiments, the size and form represented in the cut were selected as the best. The cable is quite small, being not over three-quarters of an inch in diameter, and weighing eighteen hundred weight out of water and thirteen hundred weight in water to the mile; that is to say, one-eighth the weight of the Dover and Calais cable. The centre of the cable was formed by seven fine copper wires, twisted into a cord $\frac{1}{16}$ of an inch thick. This strand was coated with gutta percha, forming a small rope $\frac{3}{8}$ of an inch thick; then coated with hempen twine soaked in pitch and tar; lastly, an external sheathing of 18 iron wires, each wire being a strand of seven finer wires, making in all 126 wires. The heart is twined together so closely as to produce contact throughout. The whole strand is as one wire for telegraphic purposes, while the number of the wires will allow each of the seven to be broken in a thousand places without interrupting the communication. That can not be severed unless all seven wires are broken at the same identical spot. Over the wires a thick coating of gutta percha was laid on with peculiar care and by repeated applications. Very nice experiments were made to insure the capacity of this gutta percha to resist the pressure of two miles of water.

The cable, thus elaborately constructed, so far fulfilled its design, that while it could support in water six miles of its own length, or say four tons weight, it is flexible enough, as Mr. Brett said, to be tied into a knot round a man's body. It was payed out with as much ease as a hempen cord. Thus the only danger to be apprehended will be materially lessened.

Some doubts were entertained as to its sinking to the bottom; but it is enough to know that it is heavier than those shells which have been taken up from the bed of the ocean by Commander Berryman while engaged in sounding along the line of the telegraph plateau.

Once on the bed of the ocean, the cable will sink, it is supposed, twenty to forty feet in the soft shells, sand, and mud, and will thus be out of reach of accident from any source.

COST OF THE CABLE.

The cost of the Atlantic Telegraph Cable, as originally made, was as follows:

Price deep-sea wire per mile	$200
Price spun yarn and iron wire per mile	265
Price outside tar per mile	20
Total per mile	$485
For 2500 miles	$1,212,500
For 10 miles deep-sea cable, at $1450 per mile	14,500
For 25 miles shore ends, at $1250 per mile	31,250
Total cost	$1,258,250

It is curious to know that the aggregate length of the smaller wires required in the manufacture of one mile of the cable was one hundred and twenty-six miles, and as there were three thousand miles provided for the first attempt, the whole cable was consequently composed of three hundred and seventy-eight thousand miles of this wire.

THE FIRST ATTEMPT.

The distance to be traversed by the cable was reckoned at 1650 miles. With 2500 miles of cable it was supposed there would be sufficient for all inequalities and losses. After consultations on all subjects and with all kinds of people, a paying-out machine had been constructed, which, it was hoped, would answer the purpose. Every thing being in proper trim, the Telegraph Fleet assembled at Valentia Bay, Ireland, at the opening of August, 1857. It consisted of the following vessels:

1. The U. S. steam frigate *Niagara*, Captain Hudson, to lay the half of the cable from Ireland.
2. The U. S. steam frigate *Susquehanna*, Captain Sands, to attend upon the *Niagara*.
3. The U. S. steamer *Arctic*, Captain Berryman, to make further soundings on the coast of Newfoundland.
4. The Telegraph Company's steamer *Victoria*, Captain Sluyter, to assist in landing the cable at Newfoundland.
5. H. M. steamer *Agamemnon*, Captain Noddall, to lay the half of the cable on the American side.
6. H. M. steamer *Leopard*, Captain Wainwright, to attend upon the *Agamemnon*.
7. H. M. steamer *Cyclops*, Captain Dayman, to go ahead of the steamers and keep the course.
8. The steamer *Advice*, Captain Raymond, to assist in landing the cable at Valentia.

On Friday (!), the seventh of August, operations began. It had been determined, after many deliberations, to commence paying out from Valentia Bay, the *Niagara* to lay the cable on the Irish side of the Atlantic, and the *Agamemnon* on the American side, taking up when the *Niagara* left.

The laying of the cable on that occasion was solemnized with the most interesting ceremonies. The Lord-Lieutenant and the nobility and gentry of Ireland in large numbers participated in them. Curiously enough, it fell to the lot of American sailors on that occasion to draw the cable to shore and to hand the end of it to the Lord-Lieutenant. It was a boat's crew of the *Niagara*, headed by Lieutenant Whiting, that performed that duty.

THE BREAK.

On the sixth day from the landing of the cable—the 11th of August—the accident occurred which put an end to the undertaking for that year. About four o'clock in the morning the cable on board the *Niagara* parted in over 2000 fathom water. The cause of the calamity was the application of the brakes, at a time when it was almost fatal to use them. The cable came up from the hold of the ship, around a central block, so to the open space above decks; it was there wound round grooved sheaths, geared together by cogs, and firmly planted on girders. Thence it passed over a fifth sheath, out over the stern into the sea, sinking by its own weight. A trifling accident happened on the 6th; this was repaired; and on the 11th, 380 miles (statute) had been submerged. The engineer here concluded that there was too much "slack" in the cable's course, and some modification in the machinery was consequently made. This appears to have been badly attended to by a subordinate. The cable snapped, and thus ended the attempt of 1857.

There was a pretty heavy swell on, and as usual under such circumstances, the stern of the vessel was elevated or depressed as she rose on each wave. It was while her stern was down that the brakes were put on, so that in addition to the strain produced by its rising again, the cable had to bear an additional strain of three thousand pounds, as marked upon the indicator. This was more than it could bear, and the consequence was that it parted, as has been stated. The moment the brakes were used the wheels stopped, and when the stern rose again they remained immovable, so that, between the strain brought upon the cable by the vessel and that caused by the application of the brakes, it had to bear more than it was ever calculated to sustain. The indicator showed a strain of three thousand pounds; but it is impossible to calculate the strain by which it was broken.

RESULT OF THE FAILURE.

Three hundred and thirty-four nautical miles of cable were successfully submerged when the accident happened. There being then left on board the two vessels too little (only a surplus of 12½ per cent.) to repeat the trial, they returned to England. The *Niagara* and *Agamemnon* discharged their cable in the naval dock-yard at Plymouth, and the former returned to the United States.

The failure cast a gloom over the enterprise in the minds of the public. Mr. Field, however, was not dismayed. He and his zealous aids had gained valuable experience by the failure.

It was feared, that, in consequence of the strain which was at times brought upon the cable, the continuity or electrical connection would have been destroyed; but during the laying of the whole 334 miles the conductor remained perfect. At one time, for two hours and a half, no signal was received through the cable, and as the cause could not be explained, it was generally believed that the continuity had ceased on account of the fracture of the core or conductor; and every thing had been prepared for the winding in of the cable, with the view of discovering the fractured part, when, suddenly and unexpectedly, it was found that the continuity, which was apparently broken, was restored, and that the signals were passing through the conductor. It was also found that the electrical character of the cable was improved by its submersion in the great depths, and that it was consequently worked with much greater ease and more satisfactory results. Now it is known that the insulating qualities of gutta percha are more perfectly developed at a temperature of forty-two degrees; and as that of the water on the plateau was about the same, the result which we have referred to is thus accounted for. It is, indeed, a well ascertained fact that a high temperature interferes with the insulation, and that the greater the heat by which the gutta percha is affected the weaker the electrical current becomes.

It was at once determined—not without opposition from some of the Directors in England—to make sufficient new cable for another attempt. It had been proved that the cable *could* be submerged to a depth of nearly two miles, and that electrical continuity could be kept up at that depth. Quite sufficient to convince all engaged in the enterprise that the cable *could* be laid. All now depended upon the machinery for paying it out, and to the construction of this the Company appointed a gentleman who was on the first attempt engineer of the *Niagara*.

MR. EVERETT.

William E. Everett, whose portrait we give herewith, was born in Watertown, Jefferson County, New York, April 17, 1826. He entered the navy as assistant-engineer in 1845, and served creditably during the Mexican war, earning his promotion to the post of assistant to Chief-Engineer, Charles H. Haswell, then at the head of the Bureau of Engineers at Washington. To Mr. Haswell Mr. Everett acknowledges himself indebted for most valuable professional training.

In 1855 Mr. E. was made member of a Board of Engineers to report upon the engines of six new war vessels. January, 1856, he was ordered to superintend the construction of the *Niagara's* engines, and on her first trip he went out as engineer in her. On her arrival in England that magnificent vessel was declared totally unfit to carry any portion of the cable. Mr. E. submitted minute plans for alterations in her interior, which, being

approved by Captain Hudson, were made, and with satisfactory results.

The first failure having proved the unfitness of the paying-out machinery then used for its purpose, the Directors of the Atlantic Telegraph Company desired of Mr. E. his views of the proper machinery. Having, not without difficulty, obtained the consent of the Secretary of the Navy to his taking service temporarily with the Telegraph Company, they gave him *carte blanche* as to cost and material in the construction of new machinery. Two months of incessant labor, men being kept at work night and day, sufficed to produce the two almost perfect and entirely self-acting machines with whose aid the cable was, at length, successfully laid.

MR. EVERETT'S PAYING-OUT MACHINE.

The machinery devised for laying the cable is pronounced by competent engineers to be as ingenious as it is simple. The great difficulties to be guarded against in paying out the wire—the difficulties, in fact, which defeated the enterprise last year—arose from the tendency of the cable to "kink" and then break, and from the sudden strains and jerks which the motion of the sea occasioned, working upon the hull of the vessel, and raising and depressing her alternately. Mr. Everett aimed to meet these difficulties. His machine, of which we give two drawings, may be described as follows:

The machine is placed on deck in the after-part of the vessel, and somewhat on the starboard side, to be clear of the mast, etc. The cable, as it comes up from its enormous coils in the hold, passes first through a guiding groove, A, and over a deeply-grooved wheel, B, on to the drums, C, D, which are each furnished with four deep grooves, each groove being cut one-eighth of an inch deeper than the former to allow for slack. The cable, after winding round these drums, passes on from the last groove over another guiding wheel, E, to a distinct piece of machinery, also standing on the deck, and half-way between the brakes and the ship's stern. Here a grooved wheel, F, works on a sliding frame, G, furnished with weights fixed on a rod, which ends in a piston inside of a cylinder, H, full of water. This piston, being made not quite large enough to fit the cylinder, the water has room to play about it, but with difficulty. It is obvious, therefore, that, yielding freely to every alteration of pressure, it can do so to none with a jerk, as the piston must be allowed some little time to dislodge the water from one side of it to the other; it acts, in short, as a water cushion. From this last piece of machinery the cable passes over a wheel or sheave projecting well over the stern of the ship, and so down into the ocean depths.

The working of the brake machinery is as follows: The engineer having fixed in his mind what amount of pressure will keep the cable at the required tension, weights the slide accordingly, the weight being hung on the shaft of the grooved wheel under which the cable passes, and, in point of fact, therefore, riding on the cable itself; an index or dynamometer is placed on the side of the frame, and indicates the exact amount of pressure exerted. Under this index is a wheel, I, with spoke handles like the steering-wheel of a river steamer, and from the drum of which a chain passes over a wheel, K, to another, M, on the shaft of which latter are nuts connected by rods with the handles of four powerful brakes, N N, etc., which act on drums, W W, etc., carried on the same shafts, S and U, as the grooved drums, C and D, and the toothed wheels, X X, etc., which are connected with the steam-engine. The brakes, like the sliding frame, G, are supplied with sliding weights, which may be slipped on or off at the engineer's pleasure, and with

SIR ALEXANDER BANNERMAN, GOVERNOR OF NEWFOUNDLAND.

a piston working in a cylinder of water, R, and acting also as a water cushion to prevent any sudden jerk. Each brake is furnished with Appold's apparatus, O, and works in a tank of water, P P, etc. The consequence of all this is, that any man of moderate intelligence and at all used to steering, stands at the steering-wheel, I, with his eye fixed on the index, just as the helmsman's on the binacle compass. The engineer instructs him what weight to keep on, just as the officer in charge tells the helmsman what point to steer for. As the rolling and pitching of the vessel increase or diminish the strain, the sliding frame, G, will have a tendency to rise or fall with the tightening or slackening of the cable. The man at the wheel corrects this tendency by a slight turn of the wheel one way or other, which acts instantly through the chain over the wheels, K and M, on the brakes, N N, and so through the drums, W W, etc., on the drums, C D.

A simpler or more ingenious contrivance it is difficult to conceive. The index always indicates unerringly to the man at the wheel the tension of the cable; the least turn of the wheel acts instantaneously and powerfully on the four brakes, which, however, are prevented by the water cylinders from acting with too abrupt a jerk.

This machinery, which was pronounced by some wiseacres emphatically unsuited to the duty it had to perform, seems to have worked admirably both on board the *Niagara* and on board the *Agamemnon*. From the hour of their parting in mid ocean to their respective arrivals in Ireland and Newfoundland, not the least accident occurred. The enormous vessels freighted with the cable rose and fell with the roll and swell of the sea; but the ingenious contrivance above described saved the cable from any sudden strain, and the careful handling of the mechanics employed, together with the simple but effective nature of the machinery, overcame the tendency to kink. It is now stated that Mr. Everett's machinery will enable any number of cables hereafter to be laid with positive certainty.

PREPARATIONS.

The winter of 1857-8 was spent in busy preparations for a second attempt, to be made early in June, 1858, that month being, according to general experience, especially calm on the North Atlantic. New experiments were made by the electricians; the new paying-out machines were thoroughly tried at sea. The experiment of paying out the cable in water nearly three miles deep, and much deeper than it is any where between Ireland and Newfoundland, was entirely successful, and the new machinery was pronounced perfect. The operation of splicing was performed four times, and the cable was paid out at the rate of seven to eight knots per hour. Finally, all was ready for the second attempt. After long consideration, it was determined to send the fleet to a point nearly mid ocean, from whence the two vessels should begin to pay out simultaneously. The particular point selected was in long. 52° 2' N., and 33° 18' W., where the depth of the ocean is 1600 fathoms.

The Telegraph squadron, consisting of the *Niagara*, the *Agamemnon*, the *Valorous*, the *Gorgon*, and the *Porcupine*, started from Plymouth Sound at ten o'clock on the morning of the 10th of June for mid ocean. A few days before sailing ninety additional miles of cable were placed on board the *Niagara* and *Agamemnon*, so that there were on board both ships 2970 miles, or a little more than fifty per cent. on the distance between Ireland and Newfoundland.

The public mind was wound up to the highest pitch of anxiety. All the omens were favorable, and it was hoped that this time the great enterprise would be successfully consummated.

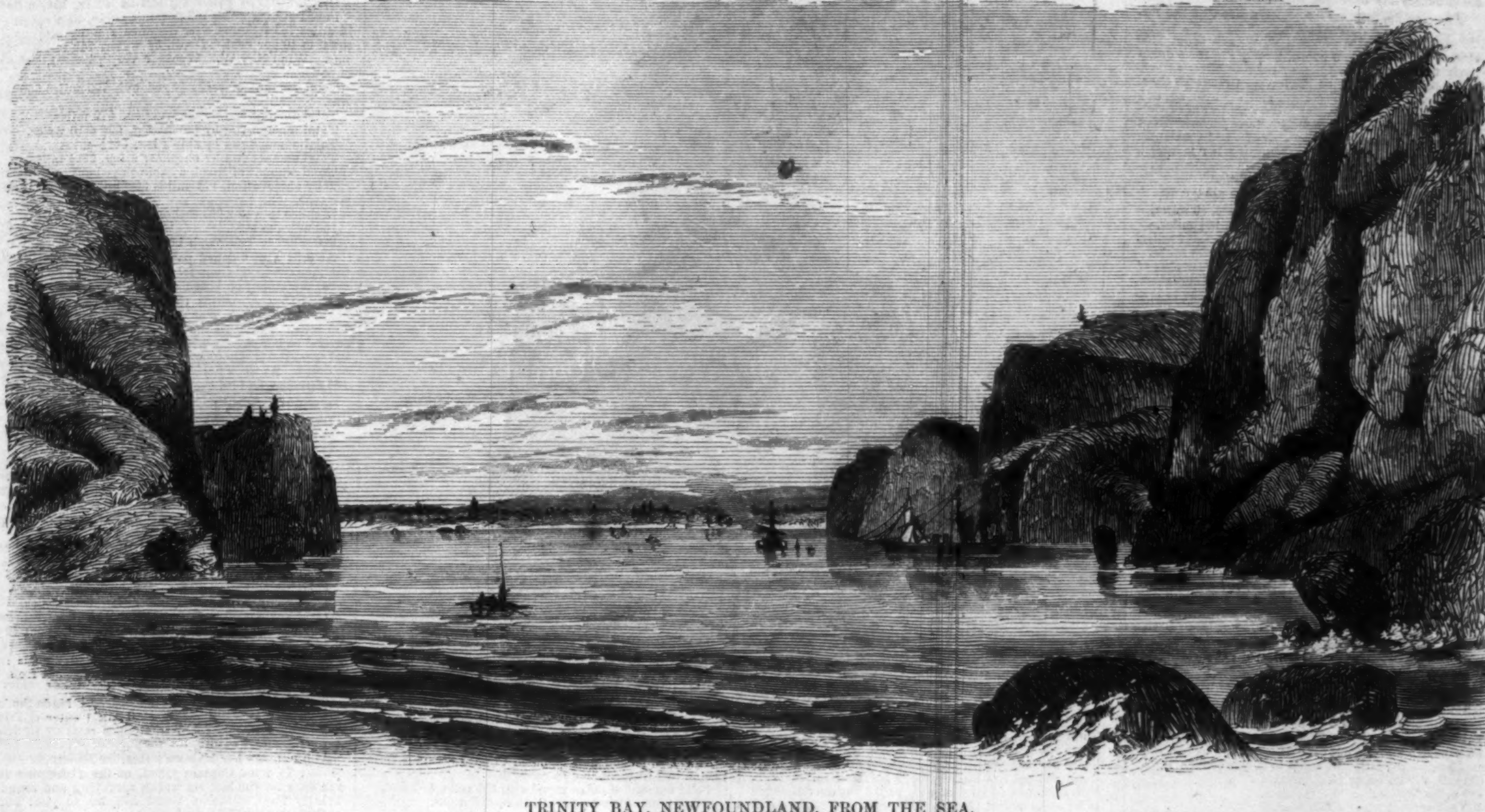
THE STORM.

On the outward passage the two vessels nearly foundered. In the terrific gale which they encountered the *Niagara* earned herself a lasting reputation as a magnificent sea-boat. Her decks, encumbered as never an old sugar-drogher's are—her cargo, stowed in a way to cause the vessel to make the worst possible weather—she yet withstood the waves, and came out of the conflict without material injury. The *Agamemnon*, one of the finest of Britain's war-steamers, suffered materially, and nearly foundered. The worst storm was during the 20th and 21st of June, when the *Agamemnon* rolled so heavily and dangerously as, in her then trim, to lead to serious fears that the masts would go overboard, or that she would capsize completely and founder. In these heavy lurches the coals, which were stowed in the main and lower decks, broke away and seriously injured several of the crew. The electric instruments were all injured. The main coil in the bottom of the ship shifted. The deck boats got adrift. The iron screw guard was wrenched in two, and the waste steam-pipe between the boilers broken, all by the heavy rolling. Twice, after every effort had been made to ease the ship, which was much hampered by the upper deck coil of 236 tons forward, it was found necessary to run before the wind, so that it was only on the 25th of June that the rendezvous was made, and the other vessels of the squadron sighted.

FAILURE AGAIN.

All the vessels having at length arrived at their central point of junction, the first splice of the ca-

RECEPTION OF THE "NIAGARA" AT ST. JOHNS, NEWFOUNDLAND, AFTER LAYING THE CABLE.



TRINITY BAY, NEWFOUNDLAND, FROM THE SEA.

ble was made on the 26th of June. After having paid out two and a half miles each, owing to an accident on board the *Niagara*, the cable parted. The ships having again met, the splice was made good, and they commenced to give out the cable a second time; but after they had each paid out about forty miles it was reported that the current was broken, and no communication could be made between the ships. Unfortunately, in this instance, the breakage must have occurred at the bottom, as the electricians, from the fine calculations which their sensitive instruments allow them to make, were able to declare such to have been the fact even before the vessels came together again. Having cast off this loss they met for the third time, and recovered the connection of the cable on the 28th. They then started afresh, and the *Niagara* having payed out over one hundred and fifty miles of cable, all on board entertained the most sanguine anticipations of success, when the fatal announcement was made upon Tuesday the 29th, at 9 P.M., that the electric current had ceased to flow. As the necessity of abandoning the project for the present was now only too manifest, it was considered that the opportunity might as well be availed of to test the strength of the cable. Accordingly, this immense vessel, with all her stores, etc., was allowed to swing to the cable, and in addition, a strain of four tons was placed upon the brakes, yet, although it was blowing fresh at the time, the cable held her as fast as if she had been at anchor for over an hour, when a heavy pitch of the sea snapped the rope, and the *Niagara* bore away for Queenstown. Before starting, an arrangement was made that should any accident occur in giving out the cable before the ships should have gone one hundred miles, they should return to their starting place in mid ocean; but that in case that distance should have been exceeded before any casualty should happen, they should make for Queenstown. In accordance with this understanding, the *Niagara* having made one hundred and nine miles before the mishap, returned to Queenstown. The *Agamemnon* returned to the place of rendezvous, waited some days, and then returned to Valentia Bay.

On the first attempt about ten miles of the cable was lost; on the second, about one hundred and twenty miles; and on the 28th the cable was again joined, and about two hundred and ninety miles was lost, making a total of four hundred and twenty miles sacrificed to Neptune, during these futile attempts of 1858.

THE FINAL AND SUCCESSFUL ATTEMPT.

The *Niagara* and *Gorgon* arrived at Queenstown on July 5th. The *Agamemnon* and *Valorous* arrived on the 12th. It was then ascertained that the final break in the cable was below the stern of the *Agamemnon*, after one hundred and forty-six miles had been payed out of that vessel. The *Agamemnon* returned to the rendezvous in mid ocean, and cruised there five days in anticipation of meeting the *Niagara*. On the *Agamemnon* arriving at Queenstown it was resolved to coal and start again for a final attempt to lay the cable, on the 17th July, there still being, on both ships, twenty-five hundred miles of the cable left.

The particulars of this final and unexpectedly successful cruise are best related in the language of Mr. Field, whose journal we therefore quote:

MR. FIELD'S JOURNAL.

Saturday, July 17, 1858.—Telegraph fleet sailed from Queenstown as follows: The *Gorgon* and *Valorous* at 11 A.M., the *Niagara* at 7½ P.M., and the *Agamemnon* a few hours later. All the steamers to use as little coal as possible in getting to the rendezvous.

* * * * * * *

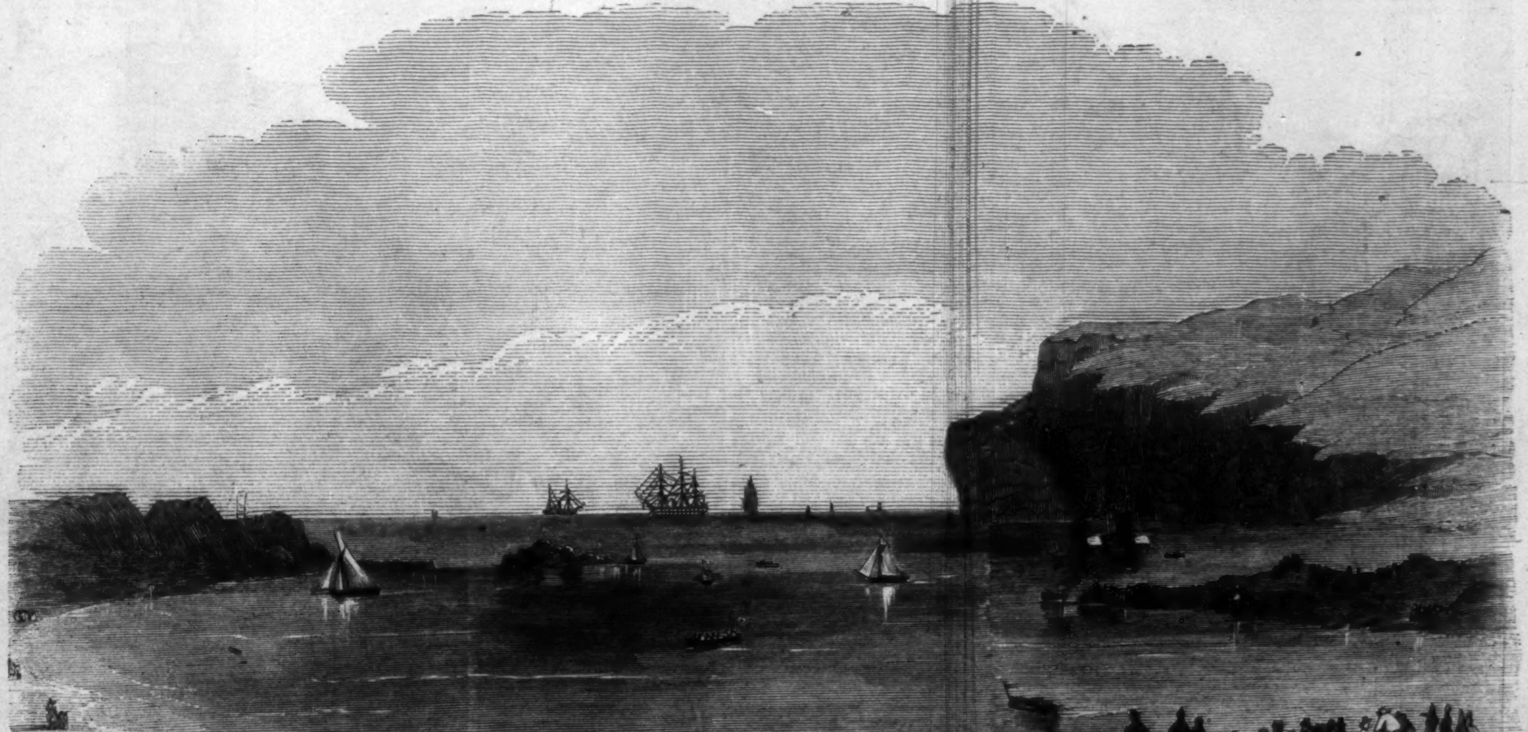
Friday, July 23.—Wind from W. by S. to W.S.W. and N.N.W.; cloudy, hazy atmosphere and rain. *Niagara* arrived at rendezvous at 8:30 P.M. Lat. 52° 5′ N., long. 32° 42′ W.

Sunday, July 25.—*Valorous* arrived at 4 A.M.; calm, hazy atmosphere and cloudy.

Tuesday, July 27.—Calm and hazy atmosphere. *Gorgon* arrived at 5 P.M.

Wednesday, July 28.—Light wind N.N.W.; same sea, blue sky, and hazy atmosphere. *Agamemnon* arrived at 5 P.M.

Thursday, July 29.—Lat. 52° 9′, long. 32° 27′; Telegraph fleet all in sight. Sea smooth; light wind from S.E. to S.S.E.: cloudy. Splice made at 1 P.M. Signals through the whole length of cable, on board both ships, perfect. Depth of water, 1550 fathoms. Distance to the entrance of Valentia Harbor, 813 nautical miles; and from there to the Telegraph house the shore end of the cable is to be laid.



VALENTIA BAY, IRELAND.

Distance to the entrance of Trinity Bay, N. F., 822 nautical miles; and from there to the Telegraph house at the head of Bay of Bulls, over 60 miles—making in all, 882 nautical miles. The *Niagara* has 69 miles further to run than the *Agamemnon*.

The *Niagara* and *Agamemnon* have each about 1100 nautical miles of cable on board, nearly the same quantity as last year.

At 7¼ P.M., ship's time, or 10:05 P.M., Greenwich time, signals from *Agamemnon* ceased, and the tests applied by the electricians showed that there was a want of continuity in the cable, but the insulation was perfect. Kept on paying out from *Niagara* very slowly, and constantly applying all kinds of electrical tests, until 9:10 P.M., ship's time, or 11½ Greenwich time, when again commenced receiving perfect signals from the *Agamemnon*.

Friday, July 30.—Lat. 51° 50′ N., long. 34° 49′ W.
Distance run by observation, last 23 hours, 89 miles.
Distance run by ship's log, last 23 hours, 99¼ miles.
Distance run by engineer's log, last 23 hours, 102 miles.
Distance run by patent last 23 hours, 105 3-10 miles.

Payed out 131 miles 900 fathoms cable, or a surplus of 42 miles 900 fathoms over distance run by observation, equal to 48 per cent. Depth of water from 1550 to 1985 fathoms. Wind from S.E. to S.

Weather, thick and rainy, with some sea. *Gorgon* in position. At 3:50 A.M. finished the main deck coil and commenced paying out from the berth deck.

435 miles from water 1465 fathoms.
547 miles from water 1080 fathoms.
577 miles from water 465 fathoms.
747 miles from water 200 fathoms.
793 miles, Telegraph house at Bay of Bull, A.M., Trinity Bay.

At 2:20, P.M., received signal from on board the *Agamemnon* that they had payed out 150 miles.

At 2:36, P.M., had payed out from *Niagara* 150 miles cable, and informed engineers on board of the *Agamemnon* of the same.

Saturday, July 31.—Lat. 51° 5′ N., long. 38° 28′ W.
Distance run by observation last 24 hours, 137 miles.
Distance run by ship's log last 24 hours, 141¼ miles.
Distance run by engineer's log last 24 hours, 142¼ miles.
Distance run by patent last 24 hours, 137 6-10 miles.

Payed out 159 miles 843 fathoms cable, or a surplus of 22 miles 843 fathoms; over distance run by observation, equal to 17 per cent. Depth of water, from 1657 to 2250 fathoms. Wind moderate, S.E. to S.W., and from 6 A.M., N.W. by N. Weather cloudy, with rain and some sea. *Gorgon* in position.

Total amount of cable payed out, 291 miles 730 fathoms.
Total amount run by observation, 226 miles.
Total amount run by patent log, 242 9-10 miles.
Total amount run by ship's log, 241¼ miles.
Total amount run by engineer's log, 244¼ miles.
Surplus cable payed out over distance run by observation, 65 miles 730 fathoms, equal to 29 per cent.

330 miles from water 1465 fathoms.
410 miles from water 1080 fathoms.
450 miles from water 465 fathoms.
510 miles from water 200 fathoms.
656 miles from Telegraph house.

At 1:14 P.M., had paid out from *Niagara* 300 miles cable, and informed engineers on board *Agamemnon* of the same. At 2:45 P.M., received signal from on board *Agamemnon* that they had payed out from her 300 miles of cable. At 5:37 P.M. finished the coil on berth deck and commenced to pay out from the lower deck.

Sunday, Aug. 1.—Lat. 50° 32′ N.; long. 41° 55′ W.
Distance by observation last 24 hours, 145 miles.
Distance by ship's log last 24 hours, 159 miles.
Distance by engineer's log last 24 hours, 142 miles.
Distance by patent log last 24 hours, 141 7-10 miles.

Payed out 164 miles 683 fathoms cable, or a surplus of 19 miles 683 fathoms over distance run by observation—equal to 14 per cent. Depth of water, 1950 to 2424 fathoms. Wind moderate and fresh from N.N.E. to N.E. Weather cloudy, misty, with squalls and heavy swell. *Gorgon* in position and keeping our course very accurately.

CAPTAIN HUDSON, OF THE "NIAGARA."

Total amount of cable payed out, 456 miles, 400 fathoms.
Total amount run by observation, 371 miles.
Total amount run by patent log, 384 6-10 miles.
Total amount run by ship's log, 380¼ miles.
Total amount run by engineer's log, 386½ miles.
Total amount of surplus cable payed out over distance run by observation, 85 miles 400 fathoms—equal to 23 per cent.

185 miles to water 1465 fathoms.
265 miles to water 1080 fathoms.
305 miles to water 465 fathoms.
365 miles to water 200 fathoms.
451 miles to water land fathoms.
511 miles to Telegraph house.

At 3:05 P.M., finished paying out coil on lower deck, and changed to coil in the hold.

Monday, Aug. 2.—Lat. 49° 52′ N., long. 45° 37′ W.
Distance run by observation last 24 hours, 154 miles.
Distance run by ship's log last 24 hours, 144 miles.
Distance run by engineer's log last 24 hours, 141 6-8 miles.
Distance run by patent log last 24 hours, 141 3-10 miles.

Payed out 177 miles 150 fathoms, or a surplus of 23 miles 150 fathoms over distance run by observation—equal to 15 per cent. Depth of water 1600 to 21,385 fathoms. Wind N., weather cloudy. *Gorgon* in position.

The *Niagara* getting light and rolling heavily, it was not considered safe to carry sail to steady her, for in case of accident, it might be necessary to stop the ship as soon as possible.

At 7 A.M. passed and signaled Cunard Steamer from Boston to Liverpool.

Total amount of cable payed out, 633 miles 500 feet.
Total amount run by observation, 525 miles.
Total amount run by patent log, 525 9-10 miles.
Total amount run by ship's log, 524¼ miles.
Total amount run by engineer's log, 528 miles.
Total surplus cable payed out over distance run by observation, 108 miles 500 fathoms, or less than 21 per cent.

31 miles from water 1465 fathoms.
111 miles from water 1080 fathoms.
151 miles from water 465 fathoms.
212 miles from water 200 fathoms.
297 miles from water, land fathoms.
357 miles from water, Telegraph house fathoms.

At 12:38 A.M., or 3:38 Greenwich time, imperfect insulation of cable detected in sending and receiving signals from *Agamemnon*, which continued until 5:48 A.M., ship's time, or 8:40 Greenwich time, when all was right again. The fault was found to be in the ward-room coil on board of this ship, about 60 miles from the lower end, which was immediately cut and taken out of circuit.

Tuesday, Aug. 3.—Lat. 49° 17′ N., long. 49° 23′ W.
Distance run by observation last 24 hours, 147 miles.
Distance run by ship's log last 24 hours, 137 miles.
Distance run by engineer's log last 24 hours, 138¼ miles.
Distance run by patent log last 24 hours, 134¼ miles.

Payed out 161 miles 763 fathoms cable, or a surplus of 14 miles 763 fathoms over distance run by observation, equal to 10 per cent. Depth of water, 742 to 1827 fathoms. Wind N.N.W. Weather very pleasant. *Gorgon* in position.

Total amount of cable payed out, 795 miles 300 fathoms.
Total amount run by observation, 672 miles.
Total amount run by patent log, 660 4-10 miles.
Total amount run by ship's log, 661¼ miles.
Total amount run by engineer's log, 666¼ miles.
Total amount of surplus cable payed out over distance run by observation, 123 miles 300 fathoms, less than 19 per cent.

74 miles to water 200 fathoms.
150 miles to land.
210 miles to Telegraph house.

At 8:26 A.M. finished paying out coil from hold, and commenced paying out from ward-room coil; 305 miles cable remaining on board at noon.

At 11:15 A.M., ship's time, received signals from on board *Agamemnon* that they had payed out from her 780 miles cable. In the afternoon and evening passed several icebergs. At 9:10 P.M., ship's time, received signal from the *Agamemnon* that she was in water of 200 fathoms. At 10:20 P.M., ship's time, *Niagara* in water of 200 fathoms, and informed *Agamemnon* of the same.

Wednesday, Aug. 4.—Lat. 48° 17′ N., long. 52° 43′ W.
Distance run by observation, 146 miles.
Distance run by ship's log, 149 miles.
Distance run by engineer's log, 149 miles.
Distance run by patent log, 142 miles.

Payed out 154 miles 360 fathoms cable, or a surplus of 8 miles; 360 fathoms over distance run by observation—equal to 6 per cent. Depth of water less than 200 fathoms. Weather beautiful—perfectly calm. *Gorgon* in position.

Total amount of cable payed out, 949 miles 660 fathoms.
Total amount run by observation, 818 miles.
Total amount run by patent log, 802 4-10 miles.
Total amount run by ship's log, 810¼ miles.
Total amount run by engineer's log, 815¼ miles.
Total amount of surplus cable payed out, over distance run by observation, 131 miles 660 fathoms, about 16 per cent.

64 miles to Telegraph house, received signals from *Agamemnon* at noon, that they had payed out from her 940 miles cable.

Passed this morning several icebergs. Made the land off entrance to Trinity Bay at 8 A.M.; entered Trinity Bay at 12¼ P.M. At 2:20 P.M. stopped sending signals to *Agamemnon* for 14 minutes, for purpose of making splice.

At 5 P.M. saw her Majesty's steamer *Porcupine* coming to us; 7¼ P.M., Captain Otter, of the *Porcupine* (who has been for the last six weeks surveying and sounding Trinity Bay), came on board *Niagara* to pilot her to anchorage near Telegraph house.

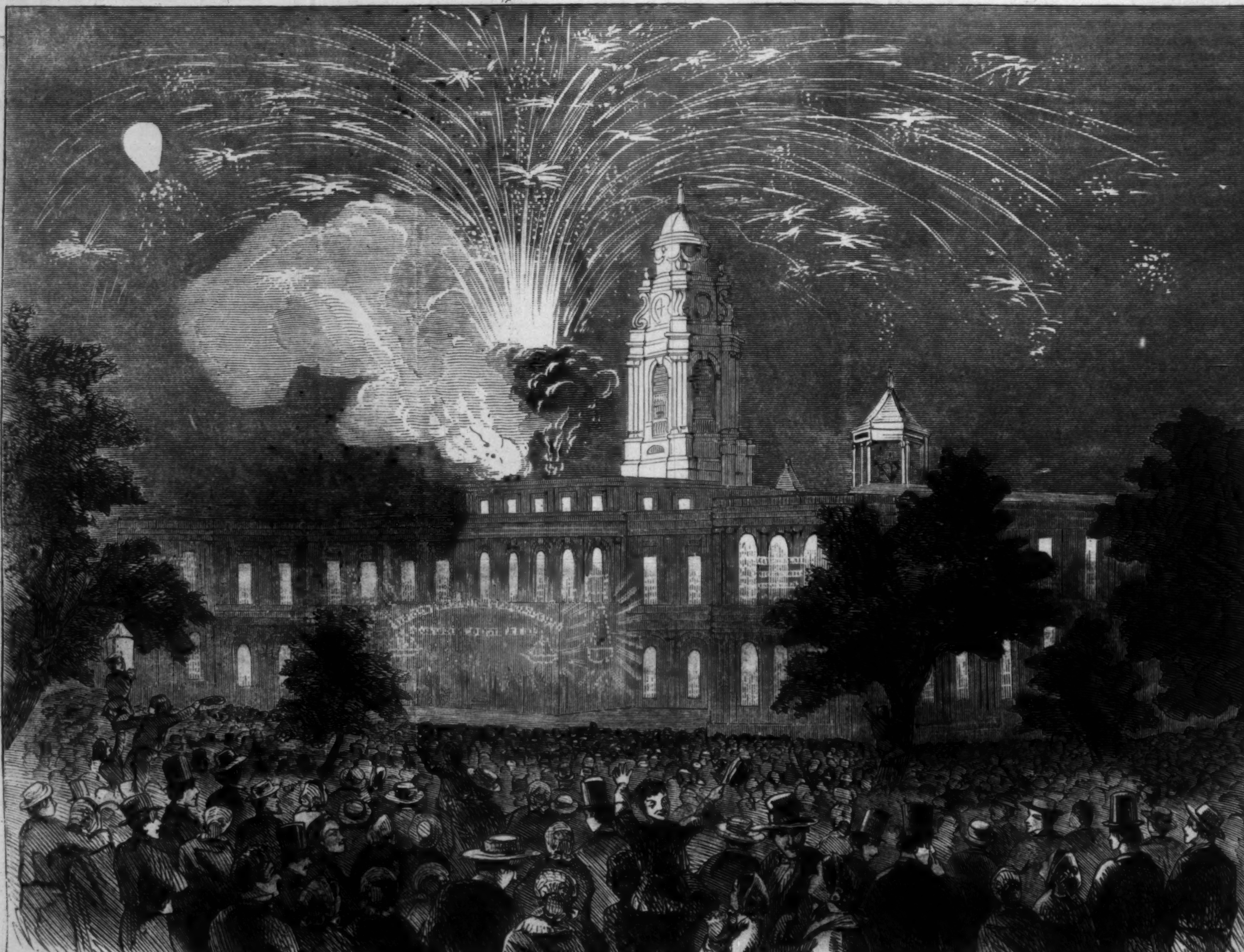
Thursday, Aug. 5.—At 1:45 A.M., *Niagara* anchored. Distance run since noon yesterday, 64 miles; amount of cable payed out, 66 miles and 382 fathoms, being a loss of less than 4 per cent.

Total amount of cable payed out since splice was made, 1016 miles and 600 fathoms. Total amount of distance, 882 miles. Amount of cable payed out over distance run, 134 miles and 600 fathoms, being a surplus of about 15 per cent.

At 2 A.M. I went ashore in small boat, awoke persons in charge of Telegraph house, half a mile from landing, and informed them that the Telegraph fleet had arrived, and were ready to land the end of the cable.

At 2:45 received signal from *Agamemnon*, that she had payed out 1010 miles cable.

At 4 A.M. delivered the following telegraphic dispatch for the Associated Press, to be forwarded to New York as early in the morning as offices of the line were opened:



ILLUMINATION OF THE CITY HALL, NEW YORK, IN HONOR OF THE ATLANTIC TELEGRAPH.

U. S. STEAM FRIGATE NIAGARA,
TRINITY BAY, N. F., *August 5*, 1858.

To the Associated Press, New York.

The Atlantic Telegraph fleet sailed from Queenstown, Ireland, Saturday, July 17, to meet in mid ocean Wednesday, 28th. Made the splice at 1 P.M., Thursday, 29th, and separated, the *Agamemnon* and *Valorous* bound to Valentia, Ireland, the *Niagara* and *Gorgon* for this place, where they arrived yesterday, and this morning the end of the cable will be landed. It is 1696 nautical, or 1950 statute miles from the Telegraph house, at the head of Valentia Harbor, to the Telegraph house at the Bay of Bulls, Trinity Bay, and for more than two-thirds of this distance the water is more than two miles in depth.

The cable has been payed out from the *Agamemnon* at about the same speed as from the *Niagara*.

The electric signals sent and received through the whole cable are perfect.

The machinery for paying out the cable worked in the most satisfactory manner, and was not stopped for a single moment from the time the splice was made until we arrived here.

Captain Hudson, Messrs. Everett and Woodhouse, the engineers, the electricians, the officers of the ship, and, in fact, every man on board the Telegraph fleet, has exerted himself to the utmost to make the expedition successful; and, by the blessing of Divine Providence, it has succeeded.

After the end of the cable is landed and connected with the land line of the telegraph, and the *Niagara* has discharged some cargo belonging to the Telegraph Company, she will go to St. Johns for coal, and then proceed to New York at once. CYRUS W. FIELD.

The machinery for paying out the cable is certainly all that could be desired—the brakes perfect.

The greatest strain ever upon the cable was 23 cwt., and that only for a short time.

The cable was payed out at an angle of from 10 to 19 degrees with the horizon, and at an average speed of 6¼ miles per hour.

The average speed of the ship during the whole time the cable was being submerged was 5¼ miles per hour.

The cable was well coiled, and ran out beautifully.

Left with Mr. De Santy, at his request, 1¼ miles of the raised cable, and there is now remaining on board this ship about 60 miles of cable manufactured this year, and about 20 miles of the cable that was submerged last year and recovered.

For many interesting particulars in regard to the laying of the cable, I would refer you to the reports of the engineers and electricians.

At 5:15 A.M. Telegraph cable landed. At 6, end of cable carried into Telegraph house, and receiving very strong currents of electricity through the whole cable from the other side of the Atlantic.

Captain Hudson, of the *Niagara*, then read prayers and made some remarks.

At 1 P.M., her Majesty's steamer *Gorgon* fired a royal salute of 21 guns.

Friday, Aug 6.—Have been receiving all day strong electric signals from the Telegraph house in Valentia.

Saturday, Aug. 7, 1858.—Steamers *Niagara*, *Gorgon*, and *Porcupine* sailed, and returned on account of the fog. I visited lead mines to engage men to work on Telegraph house, cut wood, build road, etc.

Electricians busy fitting up instruments.

Sunday, Aug. 8.—Good signals being received through the cable. Religious services at Telegraph house at 5 P.M.

Monday, Aug. 9.—Offered to remain at Trinity Bay with the electricians, if I could be of any service to them, but as I could not, left in the United States steam frigate *Niagara* at 5¼ A.M. for St. Johns, H. M. steamers *Gorgon* and *Porcupine* sailing in company.

At 6 P.M., arrived at St. Johns, where there was great rejoicing at the laying of the cable.

Received here a great number of telegraphic messages, some of which I copy:

NEW YORK, *August* 9, 1858.

To Cyrus W. Field, St. Johns.

Your family are all at Stockbridge, and well. The joyful news arrived there Thursday, and almost overwhelmed your wife. Father rejoiced like a boy. Mother was wild with delight. Brothers, sisters, all were overjoyed. Bells were rung, guns fired, children let out of school shouted, "The cable is laid!" "The cable is laid!" The village was in a tumult of joy. My dear brother, I congratulate you. God bless you! DAVID DUDLEY FIELD.

The telegraph line to the United States was occupied every moment, and I gave the officers of the steamers the privilege of sending and receiving free as many messages as they chose.

The Governor had a large dinner-party at seven, where I met many of my oldest Newfoundland friends; and later in the evening there was a grand ball at the Colonial Buildings.

ST. JOHNS, N. F., *Wednesday, Aug.* 11, 1858.

Vice-Admiral Sir Houston Stewart, K.C.B., etc., etc., Halifax, Nova Scotia.

RESPECTED SIR,—I should consider it a very great personal favor if you would permit the *Gorgon*, Captain Dayman, to accompany the *Niagara*, Captain Hudson, to New York.

English officers and English sailors have labored with American officers and American sailors to lay the Atlantic cable. They were with us in our days of trial, and pray let them, if you can, share with us our triumph.

I know this would be agreeable to Captain Dayman and his officers. Please answer here.

With high regard,
Your obedient servant,
CYRUS W. FIELD.

One end of the Atlantic cable was landed from the *Niagara* on the Irish shore August 5, 1857, and the other on the American side August 5, 1858, from the same vessel.

The heavy shore end laid last year from Valentia still remains, and the main cable is to be spliced on to it, so that both ends have been landed from the *Niagara*.

The cable now laid in Trinity Bay is the same as was submerged last year from the shore end on the Irish coast, and since recovered.

MR. FIELD TO THE DIRECTORS IN LONDON.

At your unanimous request, but at a very great personal sacrifice to myself, I accepted the office of General Manager of the Atlantic Telegraph Company for the sole purpose of doing all in my power to aid you to make the enterprise successful; and as that object has been obtained, you will please accept my resignation.

It will always afford me pleasure to do any thing in my power, consistent with my duties to my family and my own private affairs, to promote the interests of the Atlantic Telegraph Company.

I shall write you by the next mail in regard to the cable and machinery on board of the *Niagara*.

Rejoicing with you in the success which has, under the blessing of God, attended our united efforts to connect the Old and the New Worlds by the electric telegraph,

I remain, gentlemen, very truly your friend,
CYRUS W. FIELD.

THE "AGAMEMNON'S" PASSAGE.

The *Agamemnon* seems to have experienced rougher weather than the *Niagara*. In fact she was overtaken by a gale, which, though not quite so severe as the one in which both ships were caught in June, was sufficient to cause serious fears as to the safety of the cable. Nevertheless, she got safely through. The London *Times* says, exultantly:

"By a chain of electric communication, extending from Trinity Bay, Newfoundland, to this metropolis, we are informed that the last attempt to lay the Atlantic telegraph has succeeded, and that the Old and New Worlds are actually linked together by the magnetic wire. The weather proved seriously unfavorable.

"From the time the *Agamemnon* left Queenstown, on the 18th of July, until she joined the rest of the squadron at the rendezvous in mid ocean on the 29th, she experienced a continued succession of heavy winds. The splice was successfully made on the afternoon of the 29th, and the ships started toward their several stations. On the evening of the same day a breach of continuity occurred in the cable, which lasted one hour and a half.

"The ship was stopped and the machinery repaired, though not till hopes of holding on the cable had been abandoned. During Friday it blew a head gale of wind, against which the ship, under her full steam, could hardly make way, even with yards and topmasts struck. On Saturday, the 31st, the wind shifted round to the southwest, and during that day, Sunday, Monday, and Tuesday, it continued to blow hard, with frequent violent squalls, the sea running tremendously high the whole time, and no one expected the cable to hold on from one minute to the other.

"On Wednesday the weather moderated, but the swell was still high. About four A.M. the change from the lower to the upper cable was successfully made, and during the afternoon shallow water was gained. The second change from the upper to the orlop deck coil was made about nine o'clock in the evening; after which all went well until the ship anchored at six A.M. in Doulas Bay."

Another English paper says:

"How it was that with the same cable, and, as far as is known, with the same mechanical appliances, the experiment proved this time fortunate, when on the two former occasions it was a decided failure, we shall learn in due time; but the weather at least will not account for it, since the dispatch which conveys the happy news states that it has been 'very unfavorable.' It seems, however, there was 'luck in odd numbers,' since on the third trial the job was accomplished. The Directors of the Company are entitled to all the credit to be derived from courage and perseverance. They were not disheartened by two costly failures; but still having confidence in their cable, even after most other persons had lost faith in its capabilities, resolved to venture a third time, and the event has proved their calculations to be well founded. The interest taken in the issue of the experiment was vividly shown by the commotion created in the city by the news of its success, and still more substantially by the speedy rise in the value of the shares, which, after being depressed as low as £200 per share, *suddenly advanced to from £800 to £1000, with every prospect of a further increase in value.*"

THE LANDING.

The cable was landed from the *Niagara* at 5:15 A.M., on Thursday, August 5, 1858. It was landed from the *Agamemnon*, at Valentia, at 6 A.M., the 5th of August. The splice was made on board the *Agamemnon* at 1 P.M., on Thursday, the 29th of July. Less than seven days were, therefore, consumed in the laying. The progress of the two ships was nearly equal, there being at no time a diversity of more than ten miles between the amount paid out of the two cables.

TRINITY BAY.

The two landing-places of the cable are destined to more celebrity than has ever been their share in times past. The cove in Trinity Bay, Newfoundland, which has been selected as the site of the American terminus, is in a wilderness. The nearest house is several miles distant; nothing surrounds the Telegraph house but bleak rocks and barren forests.

The *Herald* correspondent thus describes the two bays:

"The approach to the bay in which the cable is to be laid is exceedingly picturesque, and possesses all that wildness and grandeur of scenery which distinguish nearly the whole coast of Newfoundland. If the weather should prove clear, the peaks of the high headlands can be seen some thirty miles from land, and a nearer view shows a country of peculiarly mountainous character. The first thing that strikes the visitor is the barren and rocky nature of the land; but there are some parts which are particularly susceptible of cultivation, and where, considering the inhospitable character of the climate, farming has been successfully carried on. It must be confessed, however, that the prospects for agricultural operations are not of the most encouraging kind, and that cod-fishing is, as it must always prove, the most lucrative occupation. Between those bleak, wild mountain ranges there are some beautiful little valleys, through which run streams of the purest sparkling water. Indeed, there is an inexhaustible supply of this common but valuable and necessary article, both in the numerous lakes, rivers, and rivulets with which the whole island abounds, and which come gushing out of every rock in the summer time, or are frozen up in icy stillness and death during the long and cheerless winter.

"The entrance to Trinity Bay is about thirty miles wide, and on either side rise the bold headlands of Baccalo and Horse Chops—the latter of which is about five hundred and the former seven hundred feet in height. The shore of the bay is marked by indentations and smaller bays, and inlets have been worn into its rocky boundaries by the restless action of the sea, which breaks here with resistless fury. Large caves, running far into the mountain barriers, have been hollowed out by the same agency, and the deep seams that scar the front of the rocks show that time has also left its mark upon them.

* * * * * *

"By looking at the map of Newfoundland it will be seen that Trinity and Placentia bays are separated by a narrow neck of land about four miles in breadth. Now this spot has been selected, not only on account of the sandy character of the beach, but for another reason no less forcible. It is intended hereafter to lay a submarine cable from Placentia Bay to the best point either in Nova Scotia or near Portland, Maine, and the brief distance, therefore, between the two bays, will tend greatly to facilitate this design. A subterranean line, four miles long, will be all-sufficient to connect the two cables, the one extending to Ireland, and through Ireland to England, Europe, and Asia; and the other to the United States and the whole of North America. At present the connection will be formed with the land line running from St. Johns, the capital city, to Cape Ray, the most extreme southwestern point on the island, where the cable which spans the Gulf was laid in the month of July, 1856. The great advantage of the proposed submarine line extending from Placentia Bay to Nova Scotia or Portland will consist in its being free from those accidents to which all land lines are liable, and to which that in Newfoundland is more particularly exposed, on account of the severity of the climate and the wild and uncultivated state of the country.

"At the head of the Bay of Bull's Arm, about half a mile from high-water line, the Telegraph house will be erected. This will be a spacious frame building, containing, in addition to the office or operator's department, a sitting-room, a kitchen, eight bedrooms, and all the other *et ceteras* of a well-appointed household.

VALENTIA BAY.

"The other terminus of the line is in Valentia Bay, which is perhaps the most available point on the whole southern coast of Ireland, both on account of its being the nearest to Newfoundland, and on account of its particular adaptability for a telegraph station. The county of Kerry, which is indented by Valentia Bay, and in which the shore-end of the cable was landed on the evening of the 6th of August last year, is very similar in its natural features to that part of Newfoundland where the cable is landed. Huge mountains rise up on almost every side, and great masses of rock, in a thousand fantastic shapes, stand out in solitary isolation miles from the land. Two of these, of such gigantic dimensions that they almost approach the dignity of mountains, guard the entrance of Dingle Bay, like weather-beaten sentinels; while further in from the ocean is a long mountain range, the face of which is worn with deep fissures, while its base is hollowed out at irregular intervals by caves, some of which extend, according to the statements of the peasantry, several hundred feet into the very heart of the mountains. The bay has a depth in some places of over a hundred fathoms, but it is so open to the sea, and the anchorage is so bad, that it is one of the worst places which a vessel could select in a storm. Valentia Bay is more protected, and although not safe in a storm, affords much better anchorage. The land, for miles into the interior, is very rocky and barren, and affords a poor pasturage for the diminutive but hardy race of cattle for which the county Kerry is famous. The huts of the peasantry which dot the hill-sides show too plainly the poverty of the lower classes of the people, and how miserably their labor is rewarded. The ruins of churches, which were built by pious Christians as long ago as the fourth or fifth century, are strikingly in accordance with the impoverished appearance of the land and of the people. The Island of Valentia suffered fearfully during the famine in Ireland, and hundreds died of starvation on the roadside or in the miserable dwellings, some of which still remain, and in which their bodies were found many weeks after their death, unburied, and in a horrible state of emaciation. The small land cove in which the bay terminates was decided upon last year as the place for the landing of the cable, and has not been changed since. It is, in fact, the very best spot that could be selected. About four hundred yards from the beach a telegraph building, somewhat similar to that at Trinity Bay, Newfoundland, has been erected and supplied with every thing necessary for the business and accommodation of the operators. The junction with the cable will be formed by a land line running to Cork, from Cork to Dublin, thence across the Channel to England, and by other connections with the great net-work of telegraphs which extends over the whole continent of Europe, and which has already embraced within it portions of Asia and Africa."

CAPTAIN HUDSON, OF THE "NIAGARA."

On 9th August Captain Hudson, who had so ably piloted his ship across the Atlantic, and aided no little by his experience and his efforts in the successful consummation of the great enterprise, left Trinity Bay for New York *via* St. Johns. He arrived safely, with the entire telegraph Company, in New York on Wednesday, August 18.

Captain Hudson, who has done himself much honor by his management of the noble ship intrusted to his care, is a New Yorker by birth and residence. He entered the service on January 1, 1816, and took rank as Post-Captain September 14, 1855. He has been nearly forty-three years in the service, of which nearly thirty-five have been passed in active service. He was a prominent and valuable officer in the United States Exploring Expedition of 1838–'42.

Since her arrival the *Niagara* has lain at the Brooklyn Navy Yard, where, by the courtesy of Commodore Kearney, the Commandant of the Yard, every facility has been afforded to the public to visit and inspect her.

For some days after the arrival of the news of the success of the cable farther intelligence was exceedingly scarce, and some fears began to harass the minds of certain doubting Thomases as to the eventual possibility of transmitting messages through the cable. The great public, however, was firm in its faith, and went on with its rejoicings. All doubt was at last set at rest on the 16th of August, by the transmission of a message from Queen Victoria to President Buchanan, *sent and received* on the same day. It will be well to place the messages on the record:

THE QUEEN'S MESSAGE.

To the President of the United States, Washington:

The Queen desires to congratulate the President upon the successful completion of this great international work, in which the Queen has taken the deepest interest.

The Queen is convinced that the President will join with her in fervently hoping that the Electric Cable which now connects Great Britain with the United States will prove an additional link between the nations whose friendship is founded upon their common interest and reciprocal esteem.

The Queen has much pleasure in thus communicating with the President, and renewing to him her wishes for the prosperity of the United States.

THE PRESIDENT'S REPLY.

WASHINGTON CITY, *Aug.* 16, 1858.

To Her Majesty VICTORIA, *Queen of Great Britain:*

The President cordially reciprocates the congratulations of Her Majesty, the Queen, on the success of the great international enterprise accomplished by the science, skill, and indomitable energy of the two countries. It is a triumph more glorious, because far more useful to mankind, than was ever won by conqueror on the field of battle.

May the Atlantic Telegraph, under the blessing of Heaven, prove to be a bond of perpetual peace and friendship between the kindred nations, and an instrument destined by Divine Providence to diffuse religion, civilization, liberty, and law throughout the world. In this view will not all nations of Christendom spontaneously unite in the declaration that it shall be forever neutral, and that its communications shall be held sacred in passing to their places of destination, even in the midst of hostilities. (Signed) JAMES BUCHANAN.

The Queen's Message was sent over piecemeal, owing to some repairs becoming necessary during its transmission from Valentia.

Mr. Field has since informed the impatient public that until September 1st the line would be kept closed for the benefit of the operators, the Company, and the Governments of the United States and Great Britain.

On the 19th of August the cable was first put to public use; M. De Santy, the operator at Trinity Bay, having sent on that day "a very explicit message to the agent of the Cunard steamers, at Liverpool, respecting the disaster to the steamer *Europa*." Mr. Field also on that day received by telegraph the congratulations of the Directors of the Telegraph Company in London.

On 17th there were general rejoicings throughout the land in honor of the success of the telegraph enterprise. New York was generally illuminated. Fire-works were set off in the Park, and by an accident the roof of the City Hall was set on fire. Our illustrations sufficiently depict the scenes.

COINCIDENCES.

Some singular coincidences in important dates have been observed. Aside from the fact that the unsuccessful attempt with the Newfoundland cable and the first unsuccessful attempt from Valentia Bay were begun on a Friday (a fact significant to sailors), the 29th of the month seems to play quite an important part, both for good and for evil, in its history. The telegraph fleet sailed from Plymouth on the experimental trip on the 29th of May. The cable was broken at the stern of the *Agamemnon*, on the first attempt to lay it, on the 29th of June; and the splice in mid ocean on the last and successful attempt was effected on the 29th of July.

The 5th of August, too, seems to be a red-letter day in the Company's calendar. On that day in 1857, the *Niagara* landed the end of the cable on the Irish shore; and on that same identical day in 1858, the same vessel landed the other end of the cable on the shore of Newfoundland—both ends of the cable being thus laid by the *Niagara*.

On the 3d of August, 1857, the telegraph squadron left the Cove of Cork for Valentia Bay, and on that very same day—365 years before—the little squadron which carried Columbus on his first voyage of discovery to these shores, weighed anchor from the port of Palos in Andalusia.

THE NEWS IN ENGLAND.

In England the rejoicings seem to have been very general also. The newspapers express their joy over the great success, as in our own country, and predict wonderful results from this new international tie. It is curious to note the effect of the news upon the latterly somewhat down-looking telegraph stock. The Liverpool *Journal* says:

"It is a habit with people on 'Change to associate every national movement with pounds, shillings, and pence. It is a way they have, and they can not help it. It is, of course, very unsentimental; but it has the small advantage of attaching an estimate of value to such matters. For instance, when the news from Valentia arrived, the inquiry was, "Who has got shares?" and the exclamation was, "I wish I had a few!" The talk was, that what on Wednesday evening would be considered dear at £300, was worth at ten o'clock on Thursday morning £1200; that, six days before, an old song would be an extravagant exchange for a share, and that one, at least, was sold for £250; that, yesterday, £900 was certainly paid for it, or one of the same family; that, no doubt, this line will provoke rivalry, but that, in the mean time, the Company will probably anticipate competition by laying down a second line."

The London *Times* has these reflections:

"The Atlantic Telegraph shares of £1000 each, which were yesterday offered at £340, immediately advanced this morning, on the receipt of the telegram of success, to a nominal quotation of £600 to £800. Later in the day it was found that holders were extremely firm, and the final price was £880 to £920. The first through message from New York is now awaited with the utmost interest, and most persons connected with the American trade are sanguine of the permanent impulse it will give to the commercial intercourse of the two countries, and the economy it will also effect by frequently preventing the profitless shipment backward and forward of goods or specie."

The Liverpool *Northern Times* says:

"And now the President of the American Union can hail Queen Victoria at Cherbourg, bid good-morning to the ruler of France, accost the King of Belgium, tell the Queen of Spain that he don't want Cuba except at a fair price, intimate to Austria and Prussia that their Embassadors at Washington and at their ports are in the enjoyment of good health. Yea, even the Czar of Russia can learn how the building of his war steamers gets on whenever he makes a contract for their construction in the United States. Merchants, too, can know the "ups and downs"—the speculative fluctuations in cotton, corn, provisions, and all other commodities imported by us from America; while the go-ahead American trader will not be slow to post himself up in the movements of every article which we send out to the Western Continent. Thus, then, the ruling Sovereigns on the eastern side of the Atlantic will be well informed of what is passing in most parts of the New World. The slightest political commotion in any State, Republic, or Kingdom, will be wafted across the entire length of the electric wires."

This is the latest statement of the affairs of the Company:

"Although the amount to participate in dividend is £4[illegible]6,000, the capital actually received is £381,000. Out of this the charge for the entire cable has been paid, with all other expenses, and a small cash balance is still in hand applicable to the current outlay. It is understood that the only additional capital now intended to be raised is the small sum that will bring the total to £500,000, and which is required for the stations, etc., that remain to be established. The colonial concessions of the Company give them an exclusive right for fifty years as regards the Newfoundland coast and the shores of Labrador and Prince Edward Island, and twenty-five years as regards Cape Breton Island. They have also a similar privilege for twenty-five years from the State of Maine.

"From the respective Governments of Great Britain and the United States the terms obtained are a payment of £14,000 per annum from each for the transmission of their messages for fifty years, until the dividends amount to six per cent. on the original capital of £350,000, after which each Government is to pay £10,000 a year, such payment to be dependent on the efficient working of the line. Previously to the failure of the first expedition, which sailed on the 4th of August, 1857, and lost 383 miles of cable, the £1000 shares touched about £1150 or £1200, and the lowest point has been £300, a sale having been made at that price since the attempt last June, when there was an additional loss of 480 miles. On the present occasion it appears that nearly 500 miles of cable remain, the total payed out from the two ships having been only 2022 miles."

There seems as yet to be some doubt as to whether "the investment will pay." On this subject a few words from Professor Morse, written after a telegraphic experiment made in October, 1856, may help the reader to a conclusion:

"There can be no question but that, with a cable containing a single conducting wire, of a size not exceeding that through which we worked, it would be easy to telegraph from Ireland to Newfoundland at the speed of at least eight or ten words per minute. Take it at ten words in the minute, and allowing ten words for name and address, we can safely calculate upon the transmission of a twenty-words' message in three minutes; * * * * or fourteen thousand four hundred words per day."

That amount would pay.

It is stated that a prospectus has been issued of a Company to complete the long-expected telegraphic communication with British Indian territories. It is to be called the European and Indian Junction Telegraph Company, with a capital of £200,000, in £10 shares. The line selected is the same as that for the Euphrates Railway—namely, from the port of Seleucia, on the Mediterranean, to the head of the Persian Gulf, following the valley of the Euphrates; and it will connect, on the one hand, with the Austrian system of telegraphs, which is to be carried to Seleucia, and on the other, with a cable to be laid by the East India Company from the Persian Gulf to the Indian port of Kurrachee. It will, therefore, supply the only link necessary to enable messages to be transmitted from London to any of the several Presidencies. Direct pecuniary support is expected from the Government and the East India Company, together with a concession from Turkey, and no call is to be made until these arrangements shall have been completed. One half the shares are to be allotted to the subscribers to the Euphrates Railway, and the other half to the public.

In conclusion, we offer the following